An Evaluation of Behavioral Skills Training and In Situ Training for Teaching Caregivers How to Support Social Skill Development in Their Child with Autism Spectrum Disorder

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Submitted in partial fulfilment
of the requirements for the degree of

Master of Arts

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Abstract

Children with autism spectrum disorder (ASD) often have social skill deficits and benefit from training that programs for skill generalization and maintenance, components that are often lacking in practice. Although caregivers are well suited to promote generalization and maintenance of child skills in the natural environment, which may lead to better outcomes, limited research has been conducted in this area. Therefore, evaluating which strategies are effective for training caregivers is highly warranted. The current research examined the efficacy of individual behavioral skills training (BST), group BST, and in situ training for teaching caregivers how to also use BST to support their child's context-specific social skills. In Study 1, caregivers met mastery criteria within individual BST sessions, although their skills did not generalize to the natural environment even with the addition of a group-BST session. In Study 2, in situ training was introduced in place of a group-BST session and led to generalized caregiver skills. The results and implications of these studies are discussed.

Keywords: caregiver/parent training, behavioral skills training (BST), in situ training, autism spectrum disorder (ASD), social skills

Acknowledgements

I would like to thank my thesis supervisor, Dr. Kendra Thomson for her patience, understanding, and ongoing support throughout my thesis. Without her support, I would have been unable to plan, execute, and finish my thesis on a timely basis. I would like to also thank all the faculty and administration in the center for applied disability studies for making the graduate experience a positive and memorable one that will have a lasting impact on my life. I would also like to thank all the staff at Lake Ridge Community Support Services, the agency where my thesis research took place. Without their cooperation and collaboration, this project would not have been possible. My sincerest appreciation and gratitude also goes out to all my friends that have listened to me and helped me push forward through difficult times. Lastly, I would like to thank my family that has been supportive of me in every step of the way. This project would not have been possible without the support of all the people in my life that have helped me along the way. Thank you everyone.

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There is a widespread adoption of social programs around the world, especially in western democratic countries such as Canada and the United States of America (Kirby & Keon, 2004; Valadez & Bamberger, 1994). Social programs target many different areas to improve the quality of life of individuals including education (e.g., Durlack, Weissberg & Pachan, 2010), physical health (e.g., Chomitz et al., 2010), mental health (Simpson & House, 2002), employment (Visher, Winterfield, & Coggeshall, 2005), and other areas. It is important to evaluate social programs to ensure individuals meant to benefit from such programs do, especially given some social programs have negatively impacted individuals in the past (Cabot, 1940). In addition to evaluating large scale programs, it is important to evaluate components of social programs and examine individual impacts so that programs can continue to develop and benefit consumers. Programs and research targeted to help individuals with autism spectrum disorder (ASD) have seen an increase alongside the growing diagnosis (Dawson, 2013; Developmental, D. M. N. S. Y., & 2010 Principal Investigators, 2014; Newschaffer, Falb, & Gurney, 2005). Researchers and clinicians should collaborate to improve existing programs to both benefit individuals immediately as well as add to the body of research. Social skills are an area of focus of programs aimed at helping individuals with ASD and some have been evaluated with positive results, especially components of teaching skills occurring in the natural environment (Patterson, Smith and Mirenda, 2012; Hotton & Coles, 2016). One way of teaching skills in the natural environment is by including caregivers in the process; however, this area has been largely understudied. Research examining caregiver training, especially in social skills is also lacking. The current research investigates the literature involving social skills training for

children with ASD, caregiver training, and the intersection of the two. Based on the literature, two studies were conducted in collaboration with a clinical agency to evaluate a caregiver training program designed to help caregivers support their child in social skills in the natural environment.

Literature Review

Autism Spectrum Disorder (ASD)

Autism spectrum disorder (ASD) is a developmental disability identified by deficits in social communication as well as restricted, repetitive patterns of behavior, interests, and activities that are present in early development, are clinically significant, and not better explained by an intellectual disability (American Psychiatric Association, 2013). Social communication deficits may present as lack of eye contact (Tanaka & Sung, 2016), difficulty in sustaining conversations and deciphering social cues (Church, Alisanski, & Amanullah, 2000; Peters & Thompson, 2015), and difficulties developing and maintaining friendships (Daniel & Billingsley, 2010). Repetitive and restricted behaviors may present as stereotyped movements (Chebli, Martin, & Lanovaz, 2016), desire for sameness (Paula-Pérez, 2013), insistence on routines (Factor, Condy, Farley, & Scarpa, 2016), and a narrow range of interests (Stocco, Thompson, & Rodriguez, 2011). These characteristics can contribute to difficulties with social skills. For example, stereotyped movements may make other children less likely to approach and become friends with a peer. Likewise, a child may have limited novel social engagements if they have a desire for sameness and insistence on routines. A narrow range of interests may limit the settings that a child interacts in and, hence, the number of other children they meet. Overall, opportunities for social skill development (e.g., initiating and maintaining conversations or long-term friendships) are a concern for individuals with ASD, a diagnosis that is increasingly

prevalent. In 2010, ASD was the most prevalent developmental disability in the United States, with an estimated 1 in 68 children being diagnosed compared to 1 in 150 in 2002 when the Centers for Disease Control and Prevention began monitoring rates (Developmental, D. M. N. S. Y., & 2010 Principal Investigators, 2014). Given the prevalence, growth, and need for support in mitigating the core challenges associated with an ASD diagnosis, there is a corresponding need for effective, efficient, and empirically validated support services for those individuals (Camargo, Rispoli, Ganz, Hong, Davis, & Mason, 2016; National Autism Center, 2009; 2015; Tanner, Hand, O'Toole, & Lane, 2015).

Evidence Based Practice for Children with Autism Spectrum Disorder

Interventions with rigorous, peer-reviewed research by multiple researchers and methodologies continue to be developed to target core ASD symptomology (Camargo, et al., 2016; National Autism Center, 2009; 2015; Reichow, Barton, Boyd, & Hume, 2012; Roth, Gillis, & Reed, 2014). Once there are many rigorous, peer-reviewed studies that have been replicated in a particular field, an evidence base is formed. Evidence-based practice (EBP) occurs when practitioners use this evidence base to inform their treatment of clients. What constitutes EBP may differ from field to field because of the types of interventions, methodologies, and targets that a field has. For example, in medicine and other health fields, the gold standard is statistical analysis from multiple randomized controlled trials (RCTs) with large numbers of participants that are assigned to treatment or control groups in systematic ways (Guyatt, Rennie, Meade, & Cook, 2008). Although RCTs are the gold standard in many fields, one of the limitations include inability to determine the effects of an intervention for an individual (i.e., RCTs provide group information, and generally do not report information on differences between individuals who respond and do not respond to an intervention although the number of individuals who respond

and associated predictor variables may sometimes be reported; Grossman & Mackenzie, 2005; Smith, 2013). Similarly, the number needed to treat (NNT) concept is the average number of people that need to receive a treatment for one person to benefit from the treatment (Suter, Briel, & Günther, 2015). This may be very helpful when looking at large populations and from a health policy standpoint, like in the case of low-dose aspirin as a prevention method for mortality from gastrointestinal bleeding (Suissa, 2015), but may not be useful in knowing what specific intervention an individual may need. These standards differ across other disciplines, such as psychology (Chambless & Hollon, 1998), nursing (Steelman, Pape, King, Graling, & Gaberson, 2011) and education (Odom, Brantlinger, Gersten, Horner, Thompson, & Harris, 2005), and may change as a discipline evolves based on specific needs. How interventions impact individuals is an important guiding principle of applied behavior analysis (Baer, Wolf, and Risley, 1968) whose proponents advocate that single-subject design methodology be included as a part of establishing EBP (O'Donohue & Ferguson, 2006). Although there is still some debate as to what constitutes evidence, most definitions of EBP are similar (Smith, 2013) and the differences depend on the specific needs of the discipline. The definition of EBP that will be used for the purposes of this research is from the American Psychological Association, ‘‘the integration of the best available research with clinical expertise in the context of patient characteristics, culture, and preferences’’ (APA, 2005, p. 5).

Evidence based practice in ASD intervention research includes 14 established interventions and 18 emerging interventions specifically for individuals under the age of 22 (National Autism Center, 2015). Established ASD interventions such as cognitive behavioral intervention packages, comprehensive behavioral treatments, social skills packages, and parent training packages, have accrued over the past couple of decades leading to a strong EBP base

(National Autism Center, 2009; 2015). However, there is still a need for research not only in furthering the depth of understanding for interventions (i.e., building on established interventions or creating new interventions) but also in the scope of the topics that are researched to aid in helping individuals with ASD (i.e., researching which components of ASD interventions best help support individuals). Well-conducted scientific research should be integrated into practice not only for implementation of interventions, but also for all aspects involving interventions for those with ASD such as dissemination and implementation (Stahmer & Aarons, 2009).

It is important to have strong EBP available as treatment options for individuals with ASD, (West, McCollow, Kidwell, Umbarger, & Cote, 2013), for practitioners to be aware of those practices (Dingfelder & Mandell, 2011), to be trained properly in those practices (Reed, & Henley, 2015), and to adhere to training and monitor progress so that interventions can be individualized (Witmer, Nasamran, Parikh, Schmitt, & Clinton, 2014). If EBP implementers are not following recommended practices and procedures correctly, whether due to being unaware of the practice, improperly trained, or procedural drift, implementers may end up delivering services that may ultimately have adverse effects on those receiving treatment (Perepletchikova & Kazdin, 2005). Given the strong foundation of EBP for youth with ASD, it is imperative that implementers are well trained using methodologies that are evidence based and lead to appropriate levels of understanding and implementation of procedures (Beidas & Kendall, 2010). When proper training occurs, it ensures that individuals continue to implement the appropriate protocols after their training is over when providing interventions so that those receiving these interventions are more likely to experience beneficial outcomes (Bick & Graham, 2010, p.13). It is important to evaluate training strategies that provide an understanding, (i.e., declarative knowledge), and lasting behavior change (i.e., procedural knowledge) so that benefits of training

can be realized by EBP implementers and the individuals receiving services (Jahr, 1998). Different skills and individuals may have different needs and consequently may require different types of training to support those individuals or train those skills. Consequently, it is important to understand which training strategies are evidence based and appropriate for an individual and skillset being taught.

Evidence Based Training Procedures

Behavioral training strategies have components that can be operationally defined and monitored by observing behaviors directly. The objective nature of behavioral training strategies lends well to assessing the efficacy of EBP training as changes in implementation behavior can be measured (Bick & Graham, 2010). For example, measuring one's knowledge on a subject after training, but not one's procedural knowledge use, may lead to results that suggest a training method is appropriate (as their knowledge on a subject increases) even if their procedural knowledge use (i.e., behavior) has not changed at all. Evidence of this phenomenon is common in areas such as fitness and financial knowledge. For example, a common belief is that being knowledgeable about health and fitness may lead to people being more physically active; however, this has been shown not to be the case (Keating, Castro-Pinero, Centeio, Harrison, Ramirez & Chen, 2010). Similarly, financial literacy has not been shown to be related to financial decisions (Tokar Asaad, 2015) unless there is a threshold level of confidence about financial knowledge present. In the behavioral field, Gardner (1972) found that role playing was more effective for teaching behavior modification *skills* while lectures were more effective in teaching *principles* of behavior modification to non-professionals. Similar results have been found in more recent evaluations. For example, Himle, Miltenberger, Gatheridge and Flessner (2004) found that children aged 4-5 participating in a gun safety program (The National Rifle

Association's Eddie Eagle GunSafe Program) could correctly state what gun safety steps should be performed, but were unable to perform the steps correctly in real life situations. In contrast, children who participated in a program developed by the researchers that included instructions, modeling, roleplaying, and feedback could both correctly state and perform gun safety skills. Competency has been shown to be more important than knowledge or time spent practicing a skill (e.g., tying a surgical knot) for retention and use of skills for ongoing use suggesting the importance of methods outside of instruction alone (Walsh, Hagemann, Dubrowski, & Carnahan, 2013). Given that there can be differences between knowledge gained (i.e., declarative knowledge) and knowledge used (i.e., procedural knowledge), it is important to have a training strategy that can measure behavior if the goal of the training program is to impart usable skills.

Various evidence-based training packages have been developed for teaching new skills, such as behavioral skills training (BST; e.g., Parsons, Rollyson & Reid, 2012), teaching interaction procedure (TIP; e.g., Kassardjian et al., 2014), direct instruction (DI; e.g., White, 1988), precision teaching (PT; e.g., Lindsley, 1992), and in situ/in vivo training (e.g., Miltenberger et al., 2005). Components of training packages have considerable overlap and have not always been consistent in their labels (see Leaf et al., 2015 for a review). For example, both BST and TIP include instructions, modeling, rehearsal and feedback. However, TIP includes two additional steps that are not explicitly stated in BST: (1) rationales and (2) demonstrations of incorrect behaviour. However, some authors may include rationales as a component of instructions and demonstrations of incorrect behaviours as a component of modeling. That is, two procedures may be identical in their components and labelled as different interventions. Differences may also exist between training packages with the same name. For example, two different training packages may be labelled as BST with one including handouts and the other

without or one including video modeling and the other including live modeling. The same procedures may also be conducted in different environments (e.g., a training environment and the natural environment) and labeled as the same procedure (e.g., BST) or different procedures (i.e., BST or in situ training). Authors describing these packages may explicitly describe certain components, while others may amalgamate or remove steps (e.g., providing a rationale as a separate step in TIP versus BST where it may be included in instructions). Packages with different names may contain the same components (e.g., BST and TIP with video modeling) and packages with the same name may contain different components (e.g., BST with and without video modeling). Because of this, it is not always clear what the exact components of a labeled package are, although broad components (e.g., rehearsing and feedback) may be understood. Despite these differences, the most common training label is BST comprised of a trainer implementing four steps with a learner: (1) instructions, (2) modeling, (3) rehearsal, and (4) feedback (Leaf et al., 2015; Miltenberger, 2008; Parsons, Rollyson & Reid, 2012). Although an argument can be made to label components individually instead of relying on an umbrella term, or using different terms for different variations of the same procedure, it may be more convenient to use an umbrella term that encompasses many variations for simplicity without much loss to the readers understanding, while explicitly describing the components. It is important to be aware of and understand how to use the specific behavioral components of training packages, which components of a training package impact the behavior change of a learner, and how the addition or removal of components impacts the individuals learning. The same label for a training package may use different underlying behavioural principles. For example, while it may be simple to call two packages that use instructions, modeling, rehearsal, and feedback with and without video modeling (i.e., demonstrations viewable via a video), BST, it is important to

understand whether the addition of the video modeling impacts the individual's learning and what underlying behavioural principles impact behaviour. The research findings regarding the critical components of BST are mixed depending on variables such as the skill being taught, the profile of the individuals receiving the training, and the required proficiency of the skill, although the impact of these and other variables have not been clearly demonstrated (Drifke et al., 2017; Kornacki, Ringdahl, Sjostrom, & Nuernberger, 2013; Ward-Horner, & Sturmey, 2012). For example, Drifke et al. (2017) found the full BST package was necessary to teach caregivers to implement three-step prompting to increase compliance, whereas Ward-Horner and Sturmey (2012) found feedback and modeling were critical components for training teachers how to conduct a functional analysis. Even within the same category there may be differences. For example, Kornacki, Ringdahl, Sjostrom and Nuernberger (2013) found different components of BST were required for young adults with ASD to learn and master conversational skills.

Using a multiple baseline design across participants, Drifke et al. (2017) examined three caregivers' (aged 42-47) ability to correctly deliver instructions to their 10-11-year-old male children. Caregiver performance was examined across three phases: (1) written instructions only, (2) written instructions and modeling, and (3) written instructions, modeling, and feedback. Caregivers delivery of correct instructions improved with both written instructions and written instructions plus modeling, but was below mastery criterion. When feedback was added, caregivers achieved mastery in each case and generalized the skills to untrained scenarios. Caregiver correct instruction delivery was associated with a decrease in child problem behavior and generalized to untrained scenarios as well. Although there were improvements with individual components of BST, mastery was not achieved for participants until the full package was delivered. Ward-Horner and Sturmey (2012) examined three teachers' ability to conduct a

functional analysis with children diagnosed with ASD aged 9-10 after receiving written instructions, video modeling, rehearsal, and feedback in different combinations. Results indicated that feedback was a necessary component to train teachers how to conduct a functional analysis and to a lesser extent, modeling. These results indicate that for different populations and skills, the necessary components may be different. Although both studies examined the necessary components of "BST", the components themselves had some variation (i.e., live modeling versus video modeling and the use of written instructions versus oral instructions). It may therefore be important to examine the efficacy of components of training packages.

Researchers can help clarify the procedures used by describing each labelled component and describing any variations from standard use (e.g., describing each component in BST). Although there may be some differences from one researcher to another, for the purposes of the current research BST is comprised of four parts: (1) instruction refers to a trainer explaining to the learner what a skill is and how to perform it (vocally, in writing, or both). Instructions may act as a discriminative stimulus alerting learners to contingencies that will be reinforced or provide rules for rule governed behaviour (Kudadjie-Gyamfi & Rachlin, 2002). (2) modeling refers to a trainer showing the learner how to perform the skill by demonstrating (live or video). Modeling allows learners to concretely see the behavior allowing discrimination and imitation. (3) rehearsal refers to the trainer giving the learner a chance to attempt the skill independently (in a roleplay/training situation or in the natural situation). Rehearsal allows learners to come into direct contact with the contingencies of the behavior and allows them to discriminate stimuli that are important in performing the skill. (4) feedback refers to a trainer providing praise on correct implementation of a skill or its components and corrective feedback for incorrect implementation of a skill or its components for the rehearsal component. Feedback provides learners with

reinforcement for demonstrating correct behaviours and shapes their behavior through corrective feedback.

The efficacy of BST has been validated for teaching numerous skills to a variety of individuals in diverse contexts, including teaching interview skills and manualized cognitive behavior therapy interventions to graduate students (Miltenberger & Fuqua, 1985; Hassan, Thomson, Khan, Burnham Riosa, & Weiss, 2017), fire safety skills to adolescents with ADHD (Houvouras & Harvey, 2014), and instructors how to teach swimming to children (Jull & Mirenda, 2016). Behavioral skills training has also been shown to be effective for training staff working with children with ASD to implement natural language paradigm (NLP; Gianoumis, Seiverling, & Sturmey, 2012), mand training (Nigro-Bruzzi & Sturmey, 2010), discrete trial training (DTT; Sarokoff & Sturmey, 2004), and behavioral intervention plans such as non-contingent reinforcement, differential reinforcement of alternative behaviors (DRA), and extinction (Hogan, Knez, & Kahng, 2015).

Behavioral skills training for staff training has demonstrated efficacy as well as efficiency. Gianoumis et al. (2012) used a multiple-baseline design across participants to train staff on NLP and standard preference assessments (SPA) and found that after only 10-minutes, staff could achieve a mean score of 95.1% (range, 89-100%) correct steps in NLP, 98% (range, 94-100%) correct steps in SPA. Consequently, children (aged 4-5) produced more appropriate vocalizations due to staff's improved performance. Similarly, Sarokoff et al. (2004) used a multiple-baseline design across participants to train teachers how to implement DTT and all participants achieved above 95% correct after a short session of BST. These results demonstrate that BST can be a very effective means of teaching staff to implement behavioral strategies.

Behavioural skills training can be used with individuals (Johnson, Miltenberger, Egemo-Helm, Jostad, Flessner, & Gatheridge, 2005) or in groups (Johnson, Miltenberger, Knudson, Egemo-Helm, Kelso, Jostad, & Langley, 2006). Group training reaches a larger audience whereas individual training may be more effective at teaching a skill depending on the difficulty of the skill for the learner, warranting each format in different circumstances (Miltenberger & Olsen, 1996). Occasionally, BST has been used in conjunction with in situ training when BST alone has not been enough for an individual to demonstrate a skill. In situ training can be used as an addition when the goal of a training program is for individuals to use the skill in the natural environment, especially if the application of the skill is essential (i.e., one "error" could lead to severe consequences), such as sexual abuse prevention skills (Egemo-Helm, Miltenberger, Knudson, Finstrom, Jostad, & Johnson, 2007), gun play prevention skills (Miltenberger, 2005), and abduction-prevention skills (Johnson, et al., 2006). In situ training involves training components that are realistic and "in the situation" and may be beneficial if learners do not acquire the skills from BST alone. For example, Egemo-Helm et al. (2007) investigated sexual abuse prevention skills in women with mild to moderate intellectual disability. After BST and in situ training, most participants demonstrated skills within 1-2 sessions. In situ training is an excellent additional training measure but may not be used when BST alone is sufficient for skill acquisition, as additional resources for in situ training (i.e., time, money, labor etc.) may be prohibitive (Miltenberger, Gross, Knudson, Bosch, Jostad, & Breitwieser, 2009).

Despite the demonstrated efficacy of the components of BST for teaching skills, evaluations of using BST to teach social skills are lacking. Using a modified multiple probe design, Peters, Tullis and Gallagher (2016) found that social skills such as asking for help, joining play sessions appropriately, and continuing play appropriately when games were changed

improved in children with ASD (aged 8-10) after a social skills group using TIP which was comprised of eight steps: (1) labeling the behavior, (2) providing a rationale to do the behavior, (3) stating when to display the behavior, (4) stating each of the behavioral steps, (5) demonstrating the social skill, (6) evaluating the experimenter's demonstration of the social skill, (7) roleplaying the social skill, and (8) providing feedback on the roleplay. This process may have been referred to as BST by different researchers with steps one to four being analogous to instructions, steps five to six to modeling, and steps seven and eight to rehearsal and feedback. Skills were maintained in later direct observations and generalized outside of the group as reported by caregivers. Hui Shyuan Ng, Schulze, Rudrud and Leaf (2016) found similar results in children (aged 9-15) with ASD and intellectual disabilities. Skills such as basic negotiation, providing a compliment and helping others increased, maintained and generalized to new settings after an individual TIP session. Limited research has been conducted with family members providing social skills training to children with ASD. One case study demonstrated that BST was a viable option for a mother and a sibling of a child with Asperger's Disorder to learn how to use BST to increase the child's frequency of targeted social skills (Stewart, Carr, & LeBlanc, 2007). Although the research on using training packages such as BST that include instructions, modeling, rehearsal and feedback is limited for training caregivers of children with ASD specifically on various skills, the available research is promising to suggest that children's social skills may increase after intervention. Further research is needed in how to best train caregivers of children with ASD how to support their child's social skills across environments.

Caregiver Training and Autism Spectrum Disorder

Given that caregivers are typically highly motivated to help their children, and spend a large amount of time with them, interventions mediated by caregivers can have considerable

impact on their child's skill development (Matson, Mahan, & LoVullo, 2009; Patterson, Smith, & Mirenda, 2012). Caregiver training is important because caregivers will be able to assist their children long after any formal intervention is introduced by clinicians. Therefore, it is vital that caregiver training not only leads to understanding the intervention, but also performing the intervention in real life scenarios. For example, if caregivers continue to reinforce their children's adaptive skills after a clinician has worked with the child, the child will be more likely to maintain their skill. However, if the caregiver does not reinforce the skill, it is unlikely the child will maintain the skill (Loughrey et al., 2014). Ongoing intervention may lead to greater generalization and maintenance of children's outcomes, but have yet to be strongly demonstrated in the literature. Caregiver training has been delivered in many formats with different target skills, each with pros and cons with some caregiver training targeting behavioral interventions generally, while others have been very specific with varying levels of effectiveness of training caregivers (Michelson, Davenport, Dretzke, Barlow, & Day, 2013). For example, Hamad and colleagues (2010) used an online learning module to teach behavior principles such as reinforcement, selection of a reinforcer, prompting, and prompt fading to caregivers and professionals with limited experience (e.g., teachers), and found that measures of knowledge on behavioral interventions increased; however, the researchers did not have the opportunity to test caregiver's ability to use their knowledge given the online nature of the program. Online programs may reach a wide audience and increase general knowledge. However, few studies have reported behavioral outcomes. Single subject designs, are appropriate for evaluating individual behavioural outcomes while maintaining experimental control (Morgan & Morgan, 2009). For example, in a single subject design (multiple baseline design), Crone and Mehta (2016) found that caregivers' (aged 35-41) use of behavioural intervention skills (i.e.,

preferences assessments, antecedent and consequent strategies for meal time) increased after two 50-minute caregiver training sessions comprised of instructions, modeling, rehearsal and feedback (the authors did not refer to the training as BST). Caregivers' children ages 6-8 showed a decrease in problem behaviours as caregiver's use of the behavioural intervention skills increased.

As mentioned, one of the core characteristics of ASD is restricted and repetitive behavior, which can present as a lack of variety in food intake. Using a waitlist control design Sharp, Burrell, and Jaquess (2013) investigated the Autism MEAL Plan, a behaviorally based caregiver-training curriculum for feeding problems. The training involved eight, 1-hour group sessions that used a didactic format to teach behavioral principles (e.g., extinction and stimulus control) for feeding problems. Results indicated that there was no change in mealtime behavior, or children's (aged 3-8) dietary variability in the treatment group compared to the control group. However, caregivers rated the program highly and had reduced stress levels after the training. These mixed results demonstrate the need to measure multiple outcomes, including behavioral changes as well as social validity of the program. In addition, the study demonstrates that although the training method was validated for professionals previously, the results did not generalize to caregivers. Social skill deficits which impede daily functioning are widespread issues for children with ASD. There is a reliance on caregiver implemented interventions to support social skill development, yet little research on training caregivers in this area. There is a clear need for caregiver training to support skill development including social skills.

Caregivers Teaching Social Skills to Children with Autism Spectrum Disorder

Limited social abilities may hinder typical developmental milestones such as establishing satisfying peer and familial relationships (Krasny, Williams, Provencal, & Ozonoff, 2003). Many

individuals with ASD may have a desire for friends, but report a fear of being teased or laughed at (Samson, Huber & Ruch, 2011). Even those who do report having friends describe the friendship as having common interests versus having social interactions amongst their friends (Orsmond, Wyngaarden Krauss, & Seltzer, 2004). A recent meta-analysis of the impacts of social skills groups for children with ASD, aged 6 to 21 years, suggested that behaviorally-oriented social skills groups improve overall social competence, friendship quality, and decrease loneliness (Reichow, Steiner & Volkmar, 2012). Including caregivers in the treatment process is considered an integral component of ASD interventions (National Research Council, 2001). Patterson, Smith and Mirenda (2012) conducted a systematic review of training programs for children with ASD and found that most caregiver behavior outcome measures included ability to implement a manualized intervention program, had child outcomes related to social skill and/or communication skill development, and were done in a multiple baseline design. For example, Crockett, Fleming, Doepke, and Stevens (2007) investigated caregiver training using instructions, demonstrations, roleplay, and practice with feedback for acquisition of discrete trials teaching and found that caregivers generalized their skills to topics they had not been specifically trained on. Kaiser, Hancock, and Nietfeld (2000) investigated caregiver training using instructions, demonstrations, roleplaying and videotapes from previous sessions to provide feedback and found that caregivers implemented a milieu procedure with successful child outcomes following the training. There have been studies that involve caregiver training and social deficits generally (Taylor, Leary, Boyle, Bigelow, Henry & DeRosier, 2015; Soorya et al., 2015) and a case study of a caregiver learning how to use BST to support specific social skills in a child with Asperger's syndrome (Stewart et al., 2007). However, to the authors knowledge, no

experimental or quasi-experimental studies have been conducted investigating BST for training caregivers how to support their child's context-specific social skills.

Some manualized interventions for children with ASD targeting social skills incorporate caregiver training including Superhero Social Skills (Block, 2010; Hood, 2010), The Junior Detective Program (Beaumont & Sofronoff, 2008) and The Program for the Education and Enrichment of Relational Skills (PEERS; Laugeson & Frankel, 2010), and have been replicated with positive results for participants (Beaumont, Rotolone, & Sofronoff, 2015; Laugeson, Gantman, Kapp, Orenski, & Ellingsen, 2015; Radley, Jenson, Clark, & O'Neill, 2014). The *Superhero Social Skills* program consists of eight weekly sessions with caregiver training occurring before child training which consists of instructions and modeling by research assistants for caregivers and takes place in a group setting. One caregiver is chosen from the group to facilitate the lesson, while the other caregivers assist with administration. The caregivers also receive coaching and feedback via Skype from the principle investigator. The Junior detective program consist of seven weekly sessions that children and caregivers attend together for the first hour playing a game. The second hour caregivers and children receive separate lessons. Caregivers learn via didactic presentation, roleplays and group discussion about what skills their children were learning in the program and how to support their children's use of these skills in real-life. The *PEERS* program consists of 16 weekly concurrent sessions for participants with teens with ASD (and has been replicated in other studies with children and young adults) and their caregivers in separate lessons. Training for the teens consisted of didactic instruction, roleplay, demonstrations of targeted skills, and social coaching with performance feedback during behavioral rehearsal exercises. Caregiver sessions consisted mostly of didactic instruction

and troubleshooting of homework exercises, but did not have any modeling or rehearsal components.

Overall, each of the caregiver components of these training programs involved at least some of the components of BST, with instructions always provided but modeling, roleplays and feedback not always incorporated. The *Superhero Skills program* used instructions, modeling, and delayed feedback. The *Junior Detective Program* used instructions, roleplays and feedback. The *PEERS* program used instructions and some feedback about reported problems. The results of studies evaluating these programs focused on child outcomes such as increases in overall social skills, frequency of social engagement, social skills knowledge, and reduced severity for ASD symptoms related to social responsiveness versus behavioral caregiver outcomes such as adherence or effects of training on caregiver implementation behavior. Given that caregivers may already play a role in interventions, it is imperative that the outcomes of caregiver training and their impact on their children are investigated.

Generalization and Maintenance of Caregiver Training

Generalization and maintenance are necessary for far-reaching and long-lasting impacts of an intervention and can occur in the following forms: (1) *setting/situation generalization* (i.e., a behavior takes place in a different setting than where the behavior was taught); (2) *response generalization* (i.e., when untrained responses that are functionally equivalent to the trained target behavior occur); and (3) *response maintenance* (i.e., the extent to which the learner continues to emit the behavior after the intervention is over.) (Cooper, Heron, & Heward, 2007). It is important that caregivers apply skills outside of the training setting and ideally in as many appropriate settings as possible. Caregivers trained in a clinical setting and applying the training in home or school environments is an example of setting generalization. One example of

response generalization in the context of caregiver training may be caregivers learning how to use BST to help their child maintain eye contact, which they perform but also extend to using BST to help their child take turns in conversation (when it was not trained to the caregiver). Response maintenance occurs if the caregiver continues to use trained skills after the training is over. Given the importance of all three forms of generalization, it is important for caregiver training to program for these components.

Social skills training for children that incorporate generalization strategies are lacking (Rao, Beidel & Murray, 2008), which may be due in part to difficulty training in settings and situations that are different from the clinic or school setting where most social skills programming take place. One potential way to address the lack of programming for generalization in social skills programs is to include caregivers so that they can support their children across different settings and situations. Training caregivers may help promote ongoing intervention in settings that clinicians may be unable to attend due a lack of resources. Individuals that have an opportunity to interact with typically developing peers outside of intervention settings tend to have more positive results compared to interventions that did not include different scenarios or situations (Barry, Klinger, Lee, Palardy, Gilmore, & Bodin, 2003). Further, incorporating naturalistic settings in interventions leads to a higher rate of success in terms of ongoing and lasting social skill development (Beidel, Turner, & Morris, 2000; Krasny, et al., 2003). Incorporating naturalistic settings into every intervention may not be feasible. However, if caregivers are prepared to intervene in naturalistic settings, there are likely to be positive outcomes in terms of their child's development (Schreibman et al., 2015). Continued support in different environments may help maintain skills that children develop (Furlong & McGilloway, 2015). Therefore, it is important that caregivers receive training that increases the

likelihood of implementing strategies across settings to increase the likelihood of child skill generalization.

General Case Analysis

When there are several variations or multiple targets of a skill, it may be important to teach in a way that addresses these variations. For example, Sprague and Horner (1984) demonstrated the benefits of general case training (i.e., multiple examples with a wide range of stimulus and response variations) to teach moderately and severely intellectually disabled students (aged 15-19) how to use vending machines. The authors compared general case training to single (i.e., one example) and multiple instance (i.e., multiple examples without specific range of stimulus and response variations) training. Although there may be some differences with how general case training is applied across researchers, there are some commonalities and recommendations for application (O'Neill, 1990) including: (1) defining the instructional universe (i.e., defining under what stimulus conditions the response/skills are to be performed); (2) defining the range of relevant stimulus and response variation (i.e., identifying the stimuli and situations that set the occasion for the responses to occur along with the variability of those stimuli and situations); (3) selecting examples for teaching and testing (i.e., choosing examples from the instructional universe sampling the relevant stimulus variation are chosen; (4) sequencing teaching examples (i.e., ordering the teaching examples so that they can be compared so the learner can see similarities and differences); (5) teaching the examples (i.e., does not differ in general case analysis compared to other methods); and (6) testing with nontrained probe examples (i.e., probing generalization with untrained stimuli). One key component in general case training is using multiple examples, which has been shown to promote generalization of different skills across populations such as teaching: a second language to preschool children

(Rosales, Rehfeldt, & Lovett, 2011); math skills to high school students (Thirus, Starbrink, & Jansson, 2016); shopping skills to adults with mild intellectual disabilities (Taylor & O'Reilly, 2000); self-care programs to group home staff (Ducharme & Feldman, 1992); and matching tasks to capuchin monkeys (Brino et al., 2014). In comparison to training that does not consider programming these elements, generalization is less likely to occur (Ducharme & Feldman, 1992; Horner, Albin & Mank, 1989).

Ducharme and Feldman (1992) investigated the use of: (1) written instructions; (2) BST with a single roleplayed case; (3) BST with a single live case; and (4) BST using multiple roleplayed cases to train group home staff skills in teaching self-care routines to clients with developmental disabilities. Using a multiple baseline design, the researchers provided training to the staff members with each of the above methods and found that skills did not effectively generalize until staff members had roleplayed multiple cases (which they called general case training). To control for sequence effects, the researchers conducted a second study where seven staff members were provided with general case training only after baseline and replicated the results of the first study. These results show the need for multiple examples for generalization of skills to occur which can be especially important when targeting multiple behaviors that may fall into a similar class (e.g., social skills). It would be beneficial if training procedures resulted in individuals generalizing from their training environment to different natural environment contexts. However, categories of individuals (e.g., professionals versus non-professionals) may require different levels of training (e.g., number of examples, type of training etc.) for different skills which need to be further evaluated to form an evidence base for recommended training procedures.

Implementation Measures

Social Validity. When evaluating interventions, in addition to primary participant measures (e.g., child or caregiver knowledge and/or skills), some other key measures should be considered including social validity and procedural integrity. When considering EBP, these primary measures may provide information about the best research and inform clinical judgement; however, other measures must be taken to ensure that client values are taken into consideration (APA, 2005). That is, it is possible that changes occur in participant behavior (e.g., improved skills in caregivers or children) but participants do not enjoy, appreciate or value the process of the behavior change. Client values are a key component in applied behavior analytic work referred to as social validity (Baer, Wolf, & Risley, 1968; Baer, Wolf & Risley, 1987). Key components of social validity include social significance of the target behavior, the appropriateness of the procedures, and the social importance of the results (Schwartz & Baer, 1991). These measures should come directly from clients so that they can voice their opinions about procedures, however in many circumstances it may be appropriate to collect this data anonymously so that clients can freely and openly do so (Foster & Mash, 1999).

Procedural Integrity. In addition to social validity measures, procedural/treatment integrity measures should also be assessed (Lee, Hamlin, Hildebrand, Carranza, Wannarka, & Hua, 2007). Procedural integrity is the extent to which the independent variable is administered as planned without the addition of other variables that may influence the dependent variable (Cooper et al., 2007). When evaluating interventions, it is important that what is being evaluated is what was described, and not a variant that may have an influence on the outcome. If procedural integrity is low, it may influence how participants respond to the treatment and the validity of the data may be questioned as it becomes difficult to interpret the results (McCay, Carter, Aiello, Quesnel, Howes, & Johansson, 2016). To avoid this problem, operational

definitions of the treatment components should be used and data collected on how the individual implanting the program sticks to the program. Procedural integrity is also important as it relates to caregiver-mediated interventions. If caregivers do not implement interventions as prescribed, depending on the components missed, it may have adverse impacts (St. Peter Pipkin, Vollmer, & Sloman, 2010. Different strategies can be utilized to help increase procedural integrity including self-monitoring (e.g., Plavnick, Ferreri, & Maupin, 2010) or implementation planning (e.g., Fallon, Collier-Meek, Sanetti, Feinberg, & Kratochwill, 2016). By collecting social validity data and procedural integrity data, the strength of evaluations of programs are strengthened and the validity and acceptability of the results are stronger (Sanetti & Kratchowill, 2009).

Purpose and Research Questions

Training caregivers to support their child's social skills in settings and situations where other practitioners may not be present may contribute to skill generalization and maintenance for both the caregivers and the child. There is a strong evidence base for the efficacy of BST and the underlying components of BST (e.g., reinforcement, shaping etc.) for teaching diverse skills to various populations including adults and children, both with and without developmental disabilities such as ASD. Therefore, BST is a viable option for both caregiver training, and for caregivers to use to support their children with ASD in social skill development.

The *purpose* of the following two studies was to assess the efficacy of a brief general case BST session comprised of instruction, modeling, rehearsal and feedback as well as the addition of a group based BST session (Study 1) and an in situ component (Study 2) for training caregivers how to support social skills in their child with ASD in a natural social setting. The evaluations addressed the following *research questions* with respect to caregivers and their own children with ASD:

1. Is a brief (50-minute) individual BST session efficacious for training caregivers to accurately implement 100% of BST steps on attempts to support their child's social skills in a contrived setting with actors role playing a child with ASD?
2. Is a brief (50-minute) BST session efficacious for training caregivers how to accurately implement the components of BST to support their child's social skills in a natural social setting?
3. Is a brief (50-minute) group BST session efficacious for increasing caregivers' accuracy in implementing the components of BST to support their child's social skills in a natural social setting?
4. Is in situ training efficacious for increasing caregivers' accuracy in implementing the components of BST to support their child's social skills in a natural social setting?
5. Do children successfully perform the social skill that caregivers prompt using BST in a natural social setting?
6. Do caregivers find BST to be a helpful strategy for assisting with their child's social skill development (i.e., do these procedures have social validity)?

Study 1

Method

This research was conducted with Lake Ridge Community Support Services, a publicly funded agency that provides treatment, education, and consultation services to support individuals with intellectual disabilities and ASD. The researcher and agency clinicians designed a caregiver training package to accompany the agency's existing 8-week child social skills program. Two studies were conducted with two separate groups of caregivers to investigate the research questions outlined above. Participant recruitment for Study 1 commenced once approval

was received from the Brock University Research Ethics Board (the agency did not have their own ethics board). After the completion of Study 1, recruitment for Study 2 commenced.

Participants. Four female caregivers of children diagnosed with ASD, (ages 6-8) and who were enrolled in an 8-week social skills group provided by the community agency were recruited to participate in Study 1. Caregivers whose children were already enrolled in the 8-week social skills group were sent a letter of invitation (Appendix A) from the agency and were asked to contact the researchers if they were interested in participating in a study examining the effects of a caregiver training model for supporting social skill development in children with ASD. Caregivers were enrolled in the research on a first come, first served basis after signing consent forms (Appendix B). Those who were unable to participate in the research but were interested in the training had the option to participate in a group-based training session. Two caregivers missed one week each during baseline, no participants withdrew from the study, and no participant's data were excluded from the study. All caregivers were the biological mothers of the children. Caregivers were given pseudonyms: Amanda, Barbara, Catherine and Daisy.

Setting and Materials. Study 1 took place at the community agency. Caregiver training sessions took place in a quiet training room with caregivers while their child participated in their regularly scheduled social skills group. All data collection sessions took place in a separate room from the caregiver training during free-play sessions of the child's social skills group where there was access to materials (e.g., toys, games, Lego, action figures, etc.) to facilitate social interactions.

Experimental Design. Caregiver training was evaluated in a concurrent multiple probe design across four participants. This type of single-case design is appropriate for assessing the effectiveness of an intervention with irreversible changes in behavior (i.e., learning occurs) and

controls for practice effects (Horner & Baer, 1978). The multiple-probe design is a modification of the multiple-baseline design in that it includes probes (single, discrete measures of behavior) rather than repeated and continuous monitoring of the behavior and has more experimental control than a pre-post design as participants receive the intervention component at staggered intervals. The staggering of the intervention allows for effects of the training to be observed while attempting to rule out the effect of other extraneous environmental variables by assessing if the other participant's baseline responding remain stable (Morgan & Morgan, 2009). Alternate variables that are unaccounted for and may have been responsible for participant behavior changes can be ruled out more confidently whereas the intervention effects can be more confidently ruled in as the causal agent of the behavior change. In addition, replications of the same pattern of results across participants increases confidence in the interventions treatment effects.

The design in Study 1 consisted of six phases: (1) baseline assessment, (2) individual BST session, (3) post-individual BST assessment, (4) group-based BST session, (5) post group-BST assessment, and (6) a one-month follow-up assessment. After stable baseline responding was observed, the first caregiver received the individual BST session (50-minutes) while the other participants remained in the baseline assessment phase. Subsequent caregiver training sessions continued in a staggered fashion on separate weeks across the 8-week child social skills group. All four caregivers also received a group training session on Week 7 of the child social skills group.

Measurement.

Primary Outcome Measure. Caregivers' implementation accuracy in supporting their child's social skills in a natural environment (with other children present) were recorded

live, by trained observers on the steps of BST: (1) providing instructions to their child on how to perform a relevant social skill; (2) modeling that social skill for their child; (3) allowing their child to perform or rehearse the social skill; and (4) providing praise and/or corrective feedback to their child about the performance of the social skill. Data on this measure was taken in each phase of the intervention to evaluate the efficacy of the intervention, and may have been on different skills during each session that caregivers were assessed (Appendix C). For example, a caregiver may have used BST in one session to support a child's initiating play and their turn taking in a different session. The social skills that the caregivers supported in each session was context-dependent. In each session, caregiver accuracy in the implementation of these steps were averaged as a percent correct (Appendix C).

Secondary Outcome Measure. The same trained observers recorded whether the children successfully performed the caregiver-prompted social skills that were specific to the situation. Child behaviour was scored as successful or unsuccessful at performing each social skill that caregivers prompted. Success was defined as the child performing the skill without the need for corrective feedback (Step 4 above) and child success was averaged as a percent correct within a session.

Social Validity. Each caregiver received an anonymous social validity questionnaire after receiving the individual BST session (Appendix D). The questionnaire used a 5-point Likert-type scale ("5" = *agree*, "3" = *neutral*, "1" = *poor*). The questionnaire asked about prior knowledge in supporting their child's social skills (e.g., I found my prior knowledge of how to support my child in social skills sufficient), thoughts about the training (e.g., I found that the behavioral skills training (BST) helped me gain knowledge in supporting my child in social skills.), confidence in supporting their child in social skills after the training (e.g., I feel confident

that I can support my child in obtaining their social skills goals) , and opinions about BST specifically including if they would recommend it to other caregivers (e.g., I would recommend BST to other caregivers who have children with ASD). Incorporating client values is an important component of both behavior analysis and EBP, as it takes into account the client's beliefs about intervention outcomes and acceptability, and not just the researchers interpretation of results (APA, 2005; Baer, Wolf, & Risley, 1968; Baer, Wolf & Risley, 1987; Schwartz & Baer, 1991). In the current study, caregivers were considered clients as all training was conducted directly with them. Caregivers' children were also considered clients, however children's perspectives were not obtained as caregivers commented that their children did not understand the social validity questions.

Procedural Integrity of Behavioral Skills Training Session. To ensure consistency of the training across caregivers, the researcher assessed procedural integrity of the individual BST sessions using a task analysis of trainer behaviour required in a training session (Appendix E). The task analysis identified 14 steps for the trainer to follow such as reminding caregivers of their rights in research, providing them with a written handout, providing a rationale for using components of BST to support social skills, modeling how to use BST for caregiver identified examples, rehearsing three examples with caregivers, providing feedback to caregivers about their performance etc. Procedural integrity was calculated across 100% of caregiver training sessions by a Board Certified Behavior Analyst® (BCBA) and was 100% across participants in Study 1.

Interobserver Agreement (IOA). Two trained observers recorded caregiver and child behavior live during free play sessions of the social skills group. Observers were required to achieve over 80% agreement with each other and a video scoring key on training videos prior

to commencing scoring in data collection sessions. That is, observers would need to re-do the training videos if they scored below 80%, however observers scored above 80% on their first attempt). A primary observer scored all data live (during free-play sessions over the 8-week social skills group) and a secondary observer double coded a random sample of 30% of sessions for reliability. Agreement for caregiver BST implementation and child social skill success were calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100% (Cooper, Heron, & Heward, 2007). After each IOA session, coders discussed any disagreements; however, the primary coders' results were reported instead of consensus. Average IOA for caregiver BST implementation was 92% (ranged 60%-100%, *SD*= 12.08) and average IOA for child social skill success was 90% (ranged 0%-100%, *SD*= 22.85). In one session, there was one observation with 0% IOA for child social skill success which may have been missed as all coding occurred live and coders may have been distracted by other children in the room; however, overall IOA was above 90%. Caregiver BST implementation was below 75% in two instances and may have been caused for similar reasons.

Percentage of non-overlapping data points (PND). To analyze effect sizes, PND calculations were conducted. The number of data points in the intervention phase were divided by the number of points above any baseline data points and multiplied by 100% (Scruggs, Mastropieri, & Casto, 1987). Using PND allows for quantified estimations and comparisons of effect sizes between interventions and is a more conservative method than similar methods of analysis such as the percentage of data points exceeding the mean (Ma, 2006). More confidence can be gained by using PND in addition to visual inspection of results if the two methods of analysis align.

Procedure.

Baseline Assessment. Caregivers were invited to join a free-play portion of their child's social skills group with other children present. The researcher provided the following instructions to the caregiver: "Please support your child in this social setting as you normally would for five minutes. I will let you know when the five minutes are up. If you are in the middle of something, please wrap up as naturally and quickly as possible." These 5-minute observation data collection probes occurred before and after the lesson portion of the social skills group (10 minutes total), for the duration of the 8-week program. Only one caregiver went into the room at a time to prevent potential confounding variables such as observational learning and to minimize disruption to the group. All caregivers were assessed within the same session and the order in which caregivers entered the social skills room was randomized for all phases.

The social skills group (that occurred in conjunction with the caregiver training for their children) started with a free-play session (where caregiver and child probes occurred), followed by a check-in where children reported how they felt that day to the social skills group leaders (trained behavioral clinicians). After the free play portion, the group leaders presented a specific social skill topic such as being a good winner/loser, conversation skills, etc. that was customized for the needs of the group. The lesson followed a BST format; children were presented instructions about the topic with examples and non-examples, the group leaders modelled these examples for the children, which was then followed by a rehearsal in which the children roleplayed in pairs or with the clinician as appropriate. Finally, group leaders provided appropriate feedback to the children on an individual basis regarding their performance. After the lesson, another free-play session took place where children had opportunities to apply their newly learned skills with each other and caregivers had opportunities to apply BST to support their child.

Individual Behavioral Skills Training. The caregiver with the most stable baseline received individual BST after three data points were obtained. Amanda received training first despite having a slightly ascending baseline because Barbara and Daisy both missed the first session and did not have three data points and Catherine had a higher ascending baseline. Barbara received training next, followed by Catherine and Daisy based on the stability of their baseline assessments. The individual BST session was consistent across participants and stayed within 50-60 minutes. A graduate student trainer pursuing his Master of Arts in Applied Disability Studies with a specialization in Applied Behavior Analysis (under the supervision of a BCBA-D®) trained caregivers how to use BST to teach social skills to their child with ASD by providing instructions, modeling examples for caregivers, rehearsing examples with caregivers and providing feedback (i.e., caregivers were trained how to use BST using BST). Parents received vocal instructions on how and why to use BST to teach social skills with a reference sheet (Appendix F). Specifically, the trainer reviewed the importance of providing instructions and reviewed important components of instructions such as ensuring children were attending, using simple language and ensuring understanding. The trainer then modelled examples and non-examples of correct use of BST to support social skills with another trainer and discussed the differences between the incorrect and correct models. They then rehearsed providing instructions and modeling only with feedback. After successfully demonstrating the ability to provide instructions and model, the trainer reviewed the importance of rehearsal, how to provide opportunities to rehearse, how to provide effective feedback and providing praise. The trainer then demonstrated the full use of BST for one of the social skills that the caregiver thought was important for their child. Afterwards, the caregiver rehearsed the three examples that they thought were most important for their child. The trainer provided feedback until the caregiver

reached mastery criterion (i.e., demonstrated 100% BST implementation accuracy across three examples). That is, training was provided on three specific skills with instructions, modeling, rehearsal and feedback (i.e., BST) until the caregiver demonstrated all of the BST steps for all three examples. The task analysis of the individual BST is summarized in Appendix E. All training was provided by the first author and a supervising BCBA who had obtained their Master's degree in Applied Disability Studies (M.ADS). The social validity questionnaires were administered to caregivers at the end of the individual training without the researcher present. Post-individual training data collection sessions were identical to baseline assessment sessions (in the natural socials skills group environment).

Group Behavioral Skills Training. All caregivers received a group BST session on Week 7 of the 8-week social skills program (after all participants had received individual training). Caregivers were reminded of each of the components of BST and the same two trainers from the individual BST session (i.e., the author and the same supervising BCBA from the individual training) modelled common examples that caregivers chose in their individual sessions and discussed those with the group. Trainers facilitated roleplays in which caregivers practiced using BST while alternating roles of both caregiver and child and provided feedback to each other. Each caregiver had an opportunity to rehearse and provide feedback to everyone in the group and have their rehearsals observed by a trainer who provided feedback and troubleshooting tips. More specifically, caregivers were reminded of the steps of BST, and provided with a list of all examples of target skills. The list of target skills was compiled from the three target skills that each caregiver selected during their individual BST session, with duplicates removed. One example was chosen from the list of skills after asking the group what skill was difficult to use BST for, and the trainers modelled the example inappropriately.

Caregivers were then asked to identify what components were missing and discuss how to include the components correctly. The trainers then modelled the same example appropriately and discussed the similarities and differences between the two examples. Caregivers then paired up and took on the role of either a child or a caregiver and roleplayed BST with an example of their choosing. Caregivers playing the role of a child were instructed to act out realistic situations and incorporate any challenges that they had come across themselves previously. They were also instructed to provide feedback to their partners once they finished the roleplay. The trainers facilitated these interactions and added additional feedback as necessary. Once both partners played the role of caregiver and child, caregivers rotated and continued to practice with a new partner and different trainer. The session took 50 minutes and was supervised by a BCBA. Post-group training data collection sessions were identical to baseline and post-individual training assessment. After group training, observers continued to take data twice a week until the end of the social skills group program in Week 8.

Follow-Up. To assess maintenance of caregiver BST implementation, the researcher and agency invited caregivers and their children to attend a "party" with all the children and caregivers involved in the social skills group program (regardless of participation in the study) one month after the social skills had ended. Children had access to the same activities that they did in free-play sessions (i.e., board games, Lego, action figures, video games etc.) to help facilitate social interactions with their peers. Caregivers were told to, "Please support your child in this social setting as you normally would." All caregivers were present throughout the follow-up session and data were taken at random 5-minute intervals for each caregiver.

Target Skills. Target skills are summarized in Table 1 below. Caregivers were not required to create a task analysis in the natural environment for each social skills target that they

chose, however broad definitions are provided for context of the skills given the environment that the skills were used in.

Table 1.

Skills Targeted by Caregivers using Behavioural Skills Training (BST) in Study 1

Target Skills	Definitions
Initiating Play	Child appropriately asks peer to play a game. Games may be one that either child is already engaged in or a new game including but not limited to Lego, Hungry Hungry Hippos, pretend etc.
Initiating Conversations	Child begins a conversation with a statement or question directed towards another child with a response from their peer. Examples include how they are, what they did over the weekend etc.
Asking for Help	Child asks a team leader, peer or caregiver for assistance on a task the child is unable to easily accomplish on their own. Examples include putting Lego together, using an electronic device etc.
Listening to Peers	Child does not interrupt when peer is speaking and is able to reply to peers' statement, question or directions. Examples include listening to the rules of a game, conversational topics etc.
Apologizing to Peers	Child says, "Sorry" for a previous inappropriate behaviour. Examples include outbursts after losing a game, interrupting peers etc.
Saying "Please" After Requests	Child says, "Please" after requesting something from a peer, team leader or an adult. Examples include saying "Please" after asking for a piece of Lego, to turn on music etc.
Sportsmanship	Child congratulates/compliments peers regardless of winning or losing a game. The child does not engage in taunting after winning or whining after losing.
Sharing Toys	Child allows peers access to toys or other objects. Examples include giving peers a Lego, an action figure etc.
Turn Taking in Conversations	Child has a reciprocal conversation (i.e., both parties contribute to the conversation). This includes asking questions, listening to and commenting on peers' responses and excludes the child interrupting their peer.

Results

The first research question was whether a brief (50-minute) individual BST session was efficacious for training caregivers to accurately implement 100% of BST steps when attempting to support their child's social skills in a contrived setting with a trainer roleplaying a child with ASD. All four caregivers demonstrated 100% accuracy of BST implementation in the 50-minute individual BST session with the trainers for three different social skills (depicted by mastery in training phase). Figure 1 presents the percentage correct BST steps implemented by caregivers to support their child's social skills (depicted by the line graph) and their child's social skill success after caregiver prompts (depicted by the bar graph) during each phase of the experiment.

The second research question was whether a brief (50-minute) BST session was efficacious for training caregivers how to accurately implement the components of BST to support their child's social skills in a natural social setting. Two of the four caregivers demonstrated minimal generalization of BST implementation with their child in post-individual training assessments within the natural social skills group setting, while the other two did not noticeably improve compared to baseline. The third research question was whether a brief (50-minute) group BST session was efficacious for increasing caregivers' accuracy in implementing the components of BST to support their child's social skills in the natural social setting. Following an additional group-BST training, no caregivers improved compared to post-individual BST and only one had improvements compared to baseline.

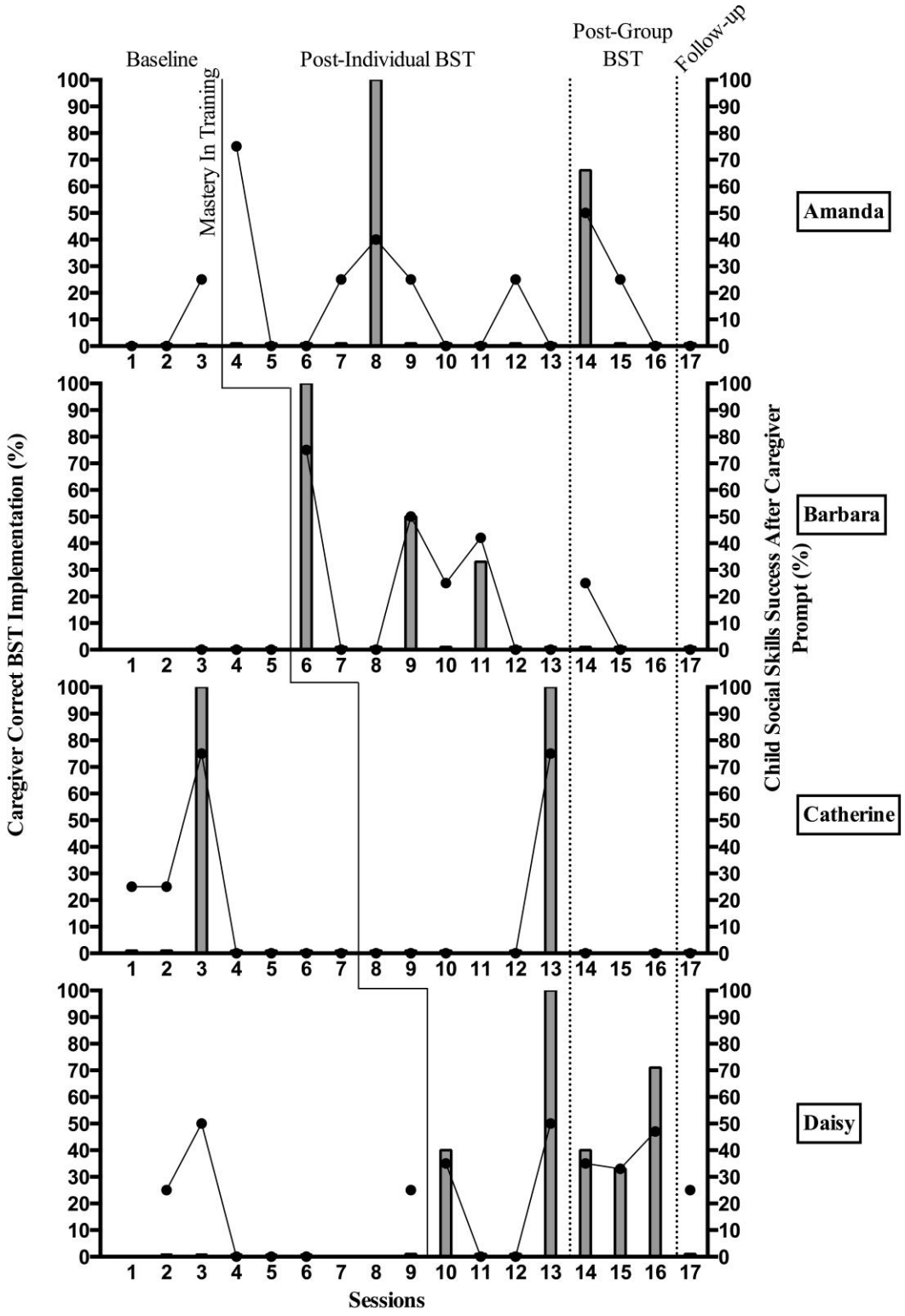

Figure 1. Caregiver BST implementation accuracy (line graph) and children's social skill performance (bar graphs) across phases (baseline, individual training, post-individual training, post-group training, and follow-up) in Study 1.

As shown in Figure 1, Amanda had an immediate increase in BST implementation accuracy from baseline to post-individual BST (25% to 75%), and returned to near baseline levels in Session 5. Amanda also demonstrated an immediate increase in correct BST implementation post-group BST (0% to 50%) but returned to baseline levels in Session 15. Amanda had 0% implementation accuracy on the follow-up probe and her child's social skill success was variable across all phases, but tended to be higher when Amanda implemented more steps of BST correctly (e.g., Session 8 and 14).

Barbara started the program one-week late and therefore her baseline assessment was delayed. She had a stable baseline at 0% implementation accuracy for three consecutive sessions and an immediate increase in BST implementation accuracy from baseline to post-individual BST (0% to 75%). She returned to 0% implementation accuracy on Session 7 and her implementation accuracy remained variable at higher levels than baseline, but lower than the initial probe post-individual BST. Barbara also demonstrated a small increase in correct BST implementation after group training but returned to 0% a session later and remained at 0% at follow-up. Barbara's child's social skill success was variable but tended to be higher when Barbara implemented more steps of BST correctly across all phases (e.g., Session 6, 9, and 11).

Catherine started with a variable baseline before becoming stable at 0% BST implementation accuracy (i.e., 4 sessions in a row). There was no difference in her responding post-individual training (i.e., 0% immediately after baseline) and remained at 0% for most of the sessions after the individual BST, with one instance where she implemented 75% of BST steps correctly on Session 13. Catherine did not show any increase in BST implementation accuracy after group training and remained at 0% implementation accuracy at follow-up. During both

sessions in which she implemented 75% of BST steps, her child was successful for 100% social skills prompted (i.e., Session 3 and 13).

Daisy missed one week during baseline, but her BST implementation remained stable after her absence. There was a slight increase in BST implementation post-individual training, although implementation accuracy was variable ranging from 0% to 50%. Post group-BST, Daisy showed more stable responding ranging from 33% to 47% but was not using 100% of the BST steps. During follow-up, Daisy implemented 25% of BST steps correctly with no child success. Similar to the other children, Daisy's child consistently performed more social skills correctly when Daisy used a more steps of BST correctly (e.g., Session 13-16).

Table 2.

Effectiveness of Individual BST Calculated by PND for Caregivers (N=4) in Study 1

Individual BST			
Caregiver	Points Greater Than Baseline	Number of Intervention Points	Effectiveness
Amanda	2	10	20%
Barbara	4	8	50%
Catherine	0	5	0%
Daisy	0	4	0%

Table 3.

Effectiveness of Group BST Calculated by PND for Caregivers (N=4) in Study 1

Group BST			
Caregiver	Points Greater Than Baseline	Number of Intervention Points	Effectiveness
Amanda	1	3	33%
Barbara	0	3	0%
Catherine	0	2	0%
Daisy	0	3	0%

Analyses of the results using percentage of non-overlapping data points (PND; Scruggs, Mastropieri, & Casto, 1987) suggest that the procedure was “ineffective”. Effectiveness (i.e., number of intervention points above baseline/number of intervention points) ranged from 0% to 50% (*M*= 17.5%) for individual BST and 0% to 33% (*M*= 8.25%) for group training. Results are summarized in Table 2 for individual training and Table 3 for group training.

The final research question was whether caregivers found BST to be a helpful strategy for assisting their child’s social skill development. All caregivers completed the social validity questionnaire after the individual BST session. Table 4 summarizes the mean scores on each of the nine questions. All four caregivers indicated that they would use BST to help their children develop their social skills and indicated that evaluating strategies for caregivers how to provide social support to children with ASD is important. No caregivers found their prior knowledge sufficient to support social skills but three caregivers agreed (and one somewhat agreed) that the training helped them gain knowledge in supporting their child’s social skills and what they learned will help them as a caregiver support their child’s social skills.

Table 4.

Mean Caregiver Social Validity Ratings (N = 4) in Study 1

Statement	Mean Score (out of 5)
Importance of Intervention	
Evaluating strategies for caregivers how to provide social support to children with ASD is important.	5
I found my prior knowledge of how to support my child in social skills sufficient.	3.75
I have learned important skills by participating in this study.	4.75
Perceptions of BST	
I found that the training (BST) helped me gain knowledge in supporting my child in social skills.	4.75
I found the trainer knowledgeable and helpful to my learning of supporting my child in social skills.	4.75
I feel confident that I can support my child in obtaining their social skills goals.	4
I think that what I have learned will help me as a caregiver to support my child in social skills.	4.75
I would recommend BST to other caregivers who have children with ASD.	4.5
I will/do use BST to help my child develop social skills regularly.	5

Study 2

Method

Study 2 replicated Study 1 except for incorporating in situ training in place of group-BST and minor modifications to data collection procedures (discussed below).

Participants. Four female caregivers and their children with ASD (ages 6-8) were recruited for Study 2 (different from Study 1) using the same procedure described in Study 1. Caregivers missed several sessions (*M*= 3 sessions, Range: 0-6 sessions) due to winter weather

restrictions and illness. Since caregivers missed several sessions, and the concern of dropout from illness, a fourth caregiver was recruited from the social skills group. Pseudonyms for caregivers in Study 2 were: Ellen, Felicia, Grace, and Hannah. Only one caregiver received training for each child in both Study 1 and 2 and were all biological mothers, except Ellen who was a biological grandmother. All caregivers received the same training, however some modifications were made for Hannah as she required additional aids to help her comprehend the material (specified below).

Setting and materials. Study 2 took place in the same agency as Study 1 and caregiver training took place in a quiet training room with caregivers while their child participated in their normally scheduled social skills group in a separate room. All data collection and in situ training sessions took place in the room where children participated in the social skills group and had access to materials to facilitate social interactions during free-play sessions (e.g., toys, games, Lego, action figures, etc.).

Measurement. All measurement was identical to Study 1 with three minor changes: (1) in Study 2 only the first two prompts per session were recorded, whereas in Study 1 the number of prompts per session were not limited. This was done to standardize the number of attempts per session across participants and make data collection more manageable for coders; (2) the social validity questionnaire was provided to caregivers to evaluate in situ training as well as individual BST; (3) each week caregivers filled out a survey about the social skills opportunities of their child and the caregivers perceived level of supporting their child (Appendix G). The survey used 5-point Likert-type scale ("5" = *Always*, “3” = *Sometimes*, "1" = *Never*). Questions included how much help they perceived their child to require social skills support, their ability to identify how to help their child in these situations, their current usage of instructions, modeling, rehearsal,

feedback, perceived success of prompted responses, independent usage of social skills, and confidence of how to help their children's social skills as well as additional comments that caregivers had each week.

Procedural integrity was 100% and caregiver BST implementation was 93% (ranged from 62.5%-100%) and average IOA for child social skill success was 89% (ranged 0%-100%, *SD*= 27.08). Similar to Study 1, there was one observation with 0% IOA for child social skill success and one instance of caregiver BST implementation below 75% which may have been missed as all coding occurred live and coders may have been distracted by other children in the room.

Experimental Design and Procedure. Study 2 assessed caregiver training within a concurrent multiple probe design across four participants. The design consisted of five phases: (1) baseline assessment, (2) individual BST, (3) post-individual BST assessment, (4) in situ training, and (5) a two-month follow-up assessment. Study 2 followed the same format as Study 1 except caregivers received in situ training if they did not maintain 100% implementation of BST steps in the post-individual assessment phase and there was no group training component.

Baseline Assessment. Caregivers were invited to join a free-play portion of their child's social skills group where other children from the social skills group were present. The researcher asked the caregiver to, "Please support your child in this social setting as you normally would for five minutes. I will let you know when the five minutes are up. If you are in the middle of something, please wrap up as naturally and quickly as possible." Unlike Study 1, two 5-minute data collection probes were taken at the end of the social skills group, opposed to one before and one after. That is, one longer free-play session occurred opposed to two shorter

free play sessions. Caregivers were randomized in the order they went in and always had at least one other caregiver go in before their second probe.

Individual Behavioral Skills Training. The caregiver with the most stable baseline received training after the start of Week 3. Ellen received training first, followed by Felicia and then Grace. Grace was unable to come in on certain weeks during baseline due to illness. The individual BST sessions were identical to Study 1 except that caregivers were given the reference sheet the week before their training and asked to think of three goals ahead of time to save time in the training session, which lasted between 45-50 minutes. All caregivers achieved a mastery criterion of 100% on BST implementation with a trainer roleplaying a child with ASD across their three chosen examples. Caregivers were given the social validity form at the end of training privately and anonymously (i.e., without the researcher present), and put the questionnaire in an envelope which was not gathered until all caregivers completed the training. All training was supervised by a BCBA. For Hannah, some modifications were made to include textual prompts to help her comprehend the material. Post-individual training data collection sessions were identical to baseline assessment sessions

In Situ Training. Caregivers received in situ training instead of group training during the free play data collection sessions. The trainer clarified the social skills that caregivers planned on targeting with their child. Once the goal was clarified, the trainer demonstrated how to prompt the target with another child in the social skills group using BST and then asked the participant if she had any questions. After questions were addressed, the caregiver attempted to find an opportunity to use BST (whether for the goal she had in mind, or another skill that came up naturally) and received feedback on their implementation of BST from the trainer. Mastery during in situ training was defined as two consecutive sessions where caregivers' accuracy of

implementing BST was 100%. That is, caregivers did not require any corrective feedback for two sessions consecutively. For example, the trainer clarified with the caregiver that a major goal for their child was initiating play and discussed a possible target skill. Once the goal was clarified, the trainer and caregiver went in to the room where free-play sessions took place (i.e., children were in the room with access to toys after their social skills group). To go through the steps of BST with the caregiver, the trainer found a child who was playing by themselves (not the caregiver's child), and provided an instruction such as, "Ask Susie if she wants to play after tapping on her shoulder, like this." (Instructions). The trainer would then model how to do so by tapping on Susie's shoulder and saying, "Do you want to play Legos with me?" and waited for a reply (Model). The trainer then prompted the child to do the same, "Now you try" and allowed the child to ask Susie to play Legos (Rehearsal). The trainer would then provide feedback to the child such as, "Great asking Susie to play Legos!" or provided corrective feedback such as, "Nice tapping Susie's shoulder, now you have to ask her if she wants to play". The trainer would then ask the caregiver if they were able to identify how the trainer implemented BST and the components, if they had any questions and addressed any questions the caregiver had. The caregiver then attempted to find another opportunity to use BST to support their own child's social skills. The skill could be the same social skill that was just modelled or a different social skill depending on the context that the caregiver found their child in. Once the caregiver identified an opportunity, they attempted to use BST in the same ways as the trainer to support the context-specific social skill. If the caregiver was 100% accurate in implementing BST, the trainer provided praise to the caregiver. If the caregiver was not 100% accurate, the trainer provided feedback and troubleshot any barriers to implementing the steps.

All in situ training was supervised by a BCBA. For Hannah, some modifications were required to assist with her comprehension needs in Session 15 and 16. Once a social skill target was identified, the author and a trainer contrived a situation with Hannah's child to reduce the complexity of the natural environment (e.g., other children's responses).

Follow-up. Caregivers and their children were invited to attend a "party" with all the children and caregivers involved in the social skills group program (regardless of participation in the study) two months after the group ended. Children had access to the same activities that they did in free-play sessions (i.e., board games, Lego, action figures, video games etc.) to help facilitate social interactions with their peers. Caregivers were told to "Please support your child in this social setting as you normally would". Data were collected on caregiver and child behavior for five minutes with only one caregiver in the room present at a time.

Target Skills. Target skills are summarized in Table 5 below. Caregivers were not required to create a task analysis in the natural environment for each social skills target that they chose, however broad definitions are provided for context of the skills given the environment that the skills were used in.

Table 5.

Skills Targeted by Caregivers using Behavioural Skills Training (BST) in Study 2

Target Skills	Definitions
Maintaining Eye Contact	Child does not look away from peer's face while peer is talking to the child. Child may look at child's face versus eyes directly.
Initiating Play	Child appropriately asks peer to play a game. Games may be one that either child is already engaged in or a new game including but not limited to Lego, Hungry Hungry Hippos, pretend etc.
Initiating Conversations	Child appropriately begins a conversation with a statement or question directed towards another child with a response from their peer. Examples include how they are, what they did over the weekend etc.
Accepting Peer Refusal	Child does not yell, cry or complain when peer does not accept peers request. Examples include peers refusing to play a new game, share toys that they are playing with etc.
Asking Peers to Stop	Child requests another child to stop engaging in an activity. Examples may be to stop touching them, taking toys without asking etc.
Listening to Peers	Child does not interrupt when peer is speaking and is able to reply to peers' statement, question or directions. Examples include listening to the rules of a game, conversational topics etc.
Sportsmanship	Child congratulates/compliments peers regardless of winning or losing a game. The child does not engage in taunting after winning or whining after losing.
Sharing Toys	Child allows peers access to toys or other objects. Examples include giving peers a Lego, an action figure etc.
Turn Taking in Conversations	Child has a reciprocal conversation (i.e., both parties contribute to the conversation). This includes asking questions, listening to and commenting on peers' responses and excludes the child interrupting their peer.

Results

Overall, three out of four caregivers implemented more components of BST than during baseline after individual-BST, yet like Study 1, caregivers did not implement all steps of BST all the time. In situ training led to more stable and increased BST implementation accuracy, apart

from Hannah who did not improve compared to baseline. Children also responded more successfully when their caregivers performed more BST steps correctly.

As shown in Figure 2, Ellen had an immediate increase in BST implementation accuracy from baseline to post-individual BST (0% to 87.5%); however, she quickly returned to near baseline levels in Session 7. Throughout in situ training, Ellen implemented BST steps more accurately than in baseline, with two instances of 100%, non-consecutively (Sessions 10 and 12). Ellen was unable to attend the follow-up session. Her child was successful 100% of the time when Ellen used more than 25% of BST steps correctly.

Felicia had an immediate and sizeable increase in BST implementation accuracy from baseline to post-individual BST (25% to 75%); however, she showed a decline to 37.5% in Session 8. She was unable to attend multiple sessions and entered in situ training when she returned in Session 13, where she scored 100% on two consecutive sessions, reaching mastery criteria. During follow-up, Felicia maintained relatively high BST implementation accuracy at 75%. Felica's child was variable in frequency of responding, but was successful 100% of the time when he did respond (e.g., Sessions 13 and 17).

Hannah did not have an increase in BST implementation accuracy from baseline to post-individual BST (25% both before and after training); however, her individual BST session was modified for the caregiver's comprehension. Instead of independently roleplaying three different examples, Hannah required a textual script during certain portions of the roleplay. In other situations, she would pause for several seconds and request a prompt of what to do next in the roleplay. Hannah received in situ training earlier than Felicia, as Felicia was unable to attend sessions. Hannah did not improve from baseline or reach 100% at any point during in situ training, and did not attend the follow-up session.

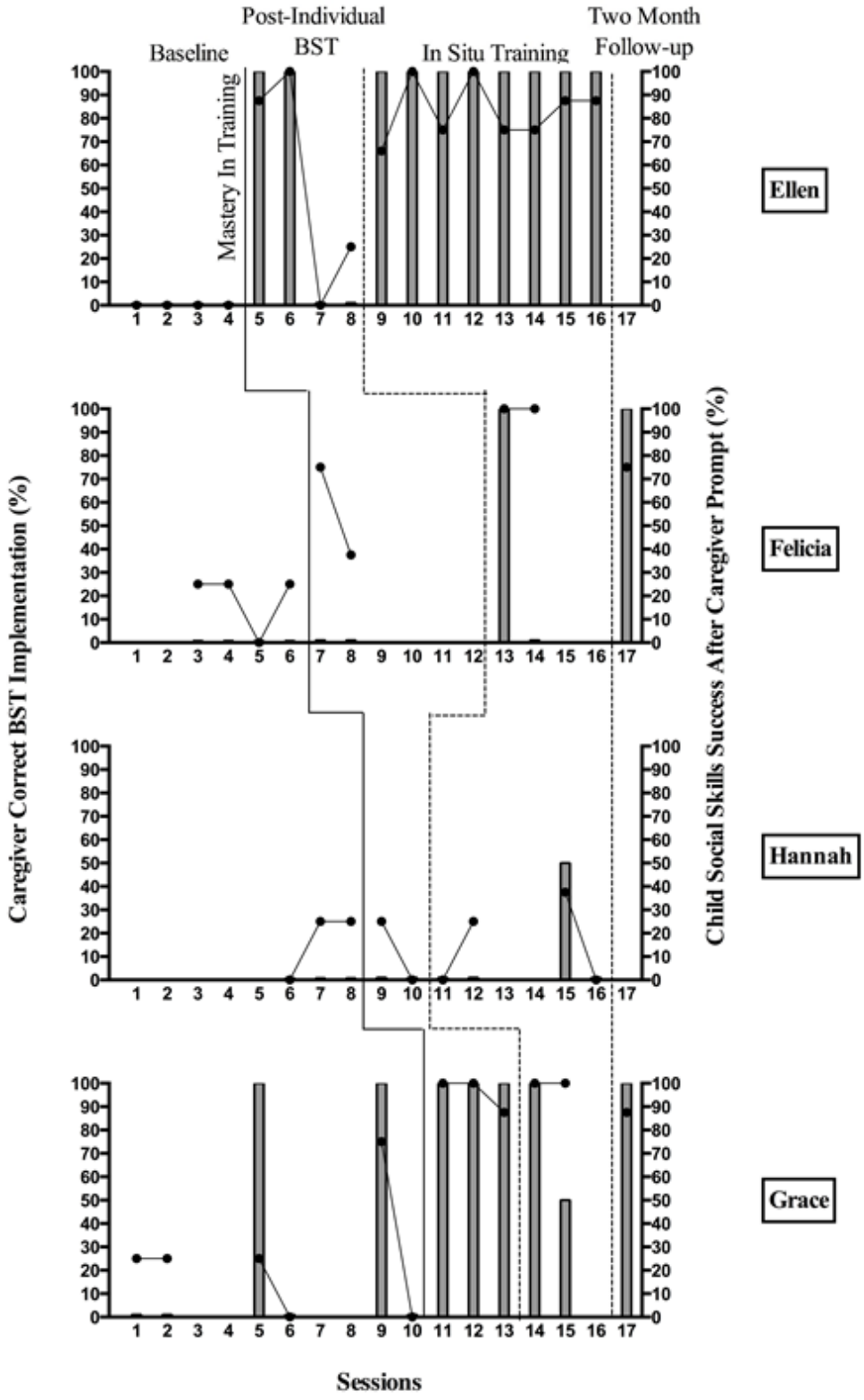

Figure 2. Caregiver BST implementation accuracy (line graph) and children's social skills performance (bar graphs) across phases (baseline, post-individual training, in situ training, and follow-up) in Study 2.

Grace demonstrated stable responding between 0% and 25% in baseline outside of one outlying data point in Session 9 (75%) and missed four baseline sessions. Grace had an immediate increase in BST implementation accuracy from baseline to post-individual BST (0% to 100%) and maintained 100% for two sessions with a slight decrease to 87.5% in Session 13. Given the slight decrease, Grace entered in situ training and scored 100% on two consecutive sessions, reaching mastery criteria. During follow-up, Grace maintained high BST implementation accuracy at 87.5%. Grace's child was successful in responding in almost all instances of Grace using multiple steps of BST (except Session 15).

Table 6.

Effectiveness of Individual BST Calculated by PND for Caregivers (N=4) in Study 2

Individual BST			
Caregiver	Points Greater Than Baseline	Number of Intervention Points	Effectiveness
Ellen	3	4	75%
Felicia	2	2	100%
Hannah	0	2	0%
Grace	3	3	100%

Table 7.

Effectiveness of In Situ Training as Calculated by PND for Caregivers (N=4) in Study 2

In Situ Training			
Caregiver	Points Greater Than Baseline	Number of Intervention Points	Effectiveness
Ellen	8	8	100%
Felicia	2	2	100%
Hannah	1	4	25%
Grace	2	2	100%

Analysis of the results using PND indicated that the individual BST session was "moderately effective", while in situ training was "effective". Effectiveness ranged from 0% to 100% (*M*= 68.75) for individual BST and 25% to 100% (*M*= 81.25%) for in situ training. Results are summarized in Table 6 for individual training and Table 7 for in situ training.

All caregivers completed the social validity questionnaire after the individual BST session and after the in situ training. Table 8 summarizes the mean scores on each of the nine questions. All four caregivers agreed that they would use BST to help their children develop their social skills and that evaluating strategies for caregivers how to provide social support to children with ASD is important. No caregivers agreed their prior knowledge was sufficient to support social skills and all caregivers agreed that the training helped them gain knowledge in supporting their child's social skills. Table 9 summarizes the mean scores on the same nine questions considering the in situ component of training.

The questionnaire for social skills opportunities could not meaningfully be analyzed given the number of missing data points. Anecdotally, caregivers did not drastically change in how much they perceived their child to require help in social situations or identify situations in which they could help over the 8-week period or from baseline to post-intervention. Caregiver self-report of implementing BST steps throughout the week did not seem to correspond with direct observations of caregiver accuracy of implementing BST. Some caregiver's perception of their child's overall social skills ability increased while others remained the same. Caregiver confidence in supporting their child in social skills seemed to increase after weeks that caregivers received the intervention.

Table 8.

Mean Caregiver Social Validity Ratings (N = 4) in Study 2

Statement	Mean Score (out of 5)
Importance of Intervention	
Evaluating strategies for caregivers how to provide social support to children with ASD is important.	5
I found my prior knowledge of how to support my child in social skills sufficient.	3
I have learned important skills by participating in this study.	4.75
Perceptions of BST	
I found that the training (BST) helped me gain knowledge in supporting my child in social skills.	5
I found the trainer knowledgeable and helpful to my learning of supporting my child in social skills.	4.75
I feel confident that I can support my child in obtaining their social skills goals.	4
I think that what I have learned will help me as a caregiver to support my child in social skills.	4.75
I would recommend BST to other caregivers who have children with ASD.	5
I will/do use BST to help my child develop social skills regularly.	5

Table 9.

Mean Caregiver Social Validity Ratings including In Situ Training (N = 2) in Study 2

Statement	Mean Score (out of 5)
Importance of Intervention	
Evaluating strategies for caregivers how to provide social support to children with ASD is important.	5
I found my prior knowledge of how to support my child in social skills sufficient.	2.5
I have learned important skills by participating in this study.	5
Perceptions of BST	
I found that the training (BST) helped me gain knowledge in supporting my child in social skills.	5
I found the trainer knowledgeable and helpful to my learning of supporting my child in social skills.	4
I feel confident that I can support my child in obtaining their social skills goals.	5
I think that what I have learned will help me as a caregiver to support my child in social skills.	5
I would recommend BST to other caregivers who have children with ASD.	5
I will/do use BST to help my child develop social skills regularly.	5

Discussion

Research Questions and Interpretation

The current research contributes to the literature for training caregivers of children with ASD in these important ways: (1) to the authors' knowledge, this is the first quasi-experimental evaluation of BST and in situ training to teach caregivers how to use BST to support their child's social skill development in natural settings; (2) 50-60 minutes of individual BST alone is

unlikely to be sufficient for caregivers to implement BST in the natural environment with 100% implementation accuracy (even with the addition of a 50-minute group BST session) although caregivers reported acceptability of the procedures; and (3) in situ training is required for most caregivers to perform 100% of BST steps correctly in the natural environment and is socially valid. These results are in line with previous research with some key differences (Ducharme & Feldman, 1992; Johnson et al., 2006; Peters et al., 2016; Sawyer et al., 2015; Stewart et al., 2007).

All caregivers across both studies implemented 100% of BST steps across three different examples within the training session indicating that a brief individual BST session was efficacious for training caregivers how to accurately implement BST steps to support their child's social skills in a contrived setting for at least three scenarios which they considered socially relevant. These results are similar to previous studies examining family members' ability to implement BST to improve social skills in that caregivers were able to successfully learn how to implement the steps of BST in training (Stewart et al., 2007). Complex skills require learners to master basic skills before they can successfully complete complex skills (Bergan & Jeska, 1980). If caregivers were unable to demonstrate the skill in a contrived scenario with minimal complexity, it would be unlikely that caregivers would be able to demonstrate the skill in more complex natural environments with their children.

Given that caregivers could demonstrate their skills in contrived settings, it was important to assess if caregivers could also generalize their skills to the natural environment after the brief individual BST session. Although caregivers' BST accuracy increased after the individual BST session compared to baseline, these skills did not generalize to the natural environment with their child, and correct use of BST decreased over time. These findings are somewhat surprising

compared to previous studies where BST alone was sufficient for caregivers to perform skills during training and in the natural environment (e.g., Crone & Mehta, 2016; Sawyer, Crosland, Miltenberger, & Rone, 2015). This difference may be due to differences in variables such as the duration of the BST session, complexity of the skills, caregivers' learning abilities, or other extraneous factors. Another possibility may be that most research examining the efficacy of BST, trains for and examines a very specific situation with minimal variations in the natural environment (if any). For example, Stewart et al. (2007) trained a caregiver how to use BST to teach her child with ASD appropriate conversational skills. The training took 18 trials of practice with an undergraduate student roleplaying her child with ASD. The caregiver was evaluated on her ability to use BST for teaching appropriate conversational skills in the natural environment with her child. The caregiver was successful in transferring her skills from the training environment to the natural environment which also maintained three months later. The total time for assessment, training, and direct observations was 13 hours. In contrast, in the current research, training was provided for three different skills that caregivers identified as important in under one hour of individual BST and under one hour of group BST in Study 1. In Study 2, training was provided in under one hour of individual BST and between 10-40 minutes of in situ training. Caregivers were then evaluated not only on their ability to use BST on the three trained examples, but also on their ability to use BST for other social skills. Given the expectation and measurement of BST for multiple skills versus a single skill (i.e., context-specific skills versus only appropriate conversational skills), the teaching of skills using BST was "looser" as caregivers did not have had strict operational definitions for target skills and were only evaluated on using the components of BST. With caregivers receiving individual BST and group BST, most caregivers demonstrated accurate BST implementation in the natural environment to some

degree but did not maintain their skills. There are many more contextual cues that are present for supporting multiple social skills and may vary from the training setting to the natural setting. Although the results are different compared to previous studies (i.e., caregivers were not successful in accurate BST implementation in the natural environment), this may be due to differences in the procedures in the current study such as training duration and measuring generalization as well as trained skills. The current study used a general case approach, where several examples were chosen for caregivers to rehearse in the training settings (i.e., both individual BST and group BST) to help promote transfer of accurate BST implementation to the natural environment. One possibility is that during training, there was not enough similarity in the stimuli and responses that matched the natural setting. In general case analysis, the stimulus conditions under which the skill will be performed are defined (i.e., defining the instructional universe; O'Neill, 1990). However, in the current training, defining the instructional universe received minimal attention. That is, although caregivers were told to look out for situations to support social skills, and specifically how to support the social skills in the training, caregivers may not have fully understood the stimulus conditions under which to use BST. If caregivers did not fully recognize the stimulus conditions under which to use BST in natural settings, this may be a possible explanation of caregivers implementing 0% of BST steps. Caregivers may have only been able to identify stimulus conditions in the training environment (i.e., respond when the roleplay began), and not the natural environment (i.e., recognize the opportunity to prompt a social skill). When caregivers could identify stimulus conditions in the natural environment and therefore started the steps of BST, they may have failed to recognize the stimuli to transition from one step to the next step (i.e., that it was time to model, provide an opportunity to rehearse or provide feedback). For example, although a caregiver may have identified an opportunity to

provide instructions and model for a child, they may not have recognized the stimuli in the environment to transition to the next steps of rehearsal and feedback accordingly. Given that caregivers received minimal training on identifying opportunities in the natural environment (i.e., defining the instructional universe), the training was closer to a general case BST hybrid (i.e., used some components of general case analysis combined with BST) versus traditional general case analysis. Despite using three examples chosen by caregivers during their individual BST, and a general case approach in the current research, it was not sufficient for caregivers to generalize their use of BST to the natural environment with acceptable implementation accuracy.

Since caregivers' BST accuracy increased but did not maintain or reach 100% in the natural environment in Study 1, the researcher examined the impact of a group BST session. Since caregiver performance did not increase following group-BST, in situ training was chosen as a replacement for additional training, based on previous research (Johnson et al., 2005; Johnson et al., 2006). Some caregivers did reach 100% accuracy of BST implementation in the natural environment after individual BST in Study 2, although, no caregivers maintained their skills at 100%. Three of four caregivers significantly improved their accuracy in implementing BST during in situ training. Two of the four caregivers reached mastery criteria and maintained high levels of BST implementation, although not at 100%. One reason to improve caregivers' ability to use BST was to lead to increases in their children's social skills. Higher rates of child success in prompted social skills were observed when caregivers implemented 100% of BST steps. These results are in line with previous research that used components of BST to successfully teach social skills to children (e.g., Hui Shyuan Ng et al., 2016; Peters et al., 2016).

Corroborating visual analysis with statistical evidence may be beneficial when interpreting single subject research (Chen & Ma, 2007). In addition to visual inspection to assess

the efficacy of individual BST, group BST and in situ training, PND analysis was used. This type of analysis is a conservative analysis that attempts to quantify effect sizes of interventions but may underestimate effect sizes as it is prone to bias with variable baseline data (Ma, 2006). However, PND may be more appropriate than less conservative methods when baselines are not variable and effect sizes are large. In Studies 1 and 2, neither the brief individual or group BST sessions were efficacious for training caregivers to implement BST in natural settings, however in situ was efficacious for three out of four caregivers to implement 100% of BST steps in the natural environment. These results align with the visual inspection interpretations, strengthening the confidence in the results.

An integral component of EBP is considering and upholding participant values and preferences, that is, ensuring social validity (APA, 2005). Key components of social validity include: social significance of the target behavior, the appropriateness of the procedures, and the social importance of the results (Schwartz & Baer, 1991). All caregivers agreed that the research was important, that they would use BST, and all agreed or somewhat agreed they would recommend BST to other caregivers with children with ASD. All caregivers agreed or somewhat agreed that the training helped them gain knowledge to support their children's social skills and what they learned would help them support social skill development in their child. Collectively these results indicate that the overall research had social validity.

Implications

There is a strong literature base for interventions for children with ASD (e.g., National Autism Center, 2015); however, limited research has evaluated the most efficient and effective ways for training individuals to implement these interventions. The current research findings make important contributions to the literature base regarding recommended practice for training

mediators. Although BST is a validated method of training, 50 minutes of individual BST was not sufficient in this evaluation to train seven out of eight caregivers how to use BST to support their child's social skills in the natural environment. Therefore, it follows that training methods that are less rigorous than individual BST (e.g., providing written handouts, group presentations, etc.) are unlikely to alter caregivers' behavior for the same or similarly complex skills when evaluated in the natural environment (Nafukho, Alfred, Chakraborty, Johnson, & Cherrstrom, 2017). It is important to note that although an additional 50 minutes of group training did not lead to increases in the generalization and maintenance of skills, it is possible that additional individual BST sessions may have increased generalization of caregivers' skills in the natural environment. Although the individual BST session was brief, in situ training was also brief for most caregivers. Study 2 demonstrated that a combination of individual BST and in situ training lead to caregivers implementing more BST steps accurately with their child compared to baseline and individual BST despite demonstrating the ability to do so in a training setting. Together the results of Studies 1 and 2 suggest that in situ training may be a better suited training strategy compared to group-BST for generalizing skills to the natural environment. Clinicians should consider in situ training when possible if the goals of their program involve changing behavior in the natural environment. If in situ is not possible, it is important to assess if current training methods lead to generalization in the natural environment. Researchers and clinicians should investigate the impact of their training methods in the natural environment to ensure skills have been generalized (Himle et al., 2004).

Not all training may require generalization as different training packages may have different goals. For example, a training session about general awareness of ASD may not have specific behavioral goals for trainees to perform after the training session – however, the goals

may be to increase knowledge (i.e., declarative knowledge) and establish a base for further learning. However, if training is meant to teach a specific skill, it is important to ensure that these skills can be performed both in the training setting, as well as in the natural setting. If skills do not generalize from the training setting to the natural setting, it is imperative further training is provided to promote generalization.

Social skills training that is conducted in the natural environment may lead to greater generalization and maintenance of children's skills compared to training in contrived settings (Bellini et al., 2007). Given that caregivers are in children's natural environments, training them to support their children may be one option to increase children's social skill and generalization. In addition, it may be more natural for caregivers to be available to prompt social skills in natural environments than clinicians. The value of social skills programs is diminished if children do not implement social skills learned in a training environment to the natural environment. This research supports that the same is true of training programs for caregivers. If caregivers do not generalize skills from the training environment to the natural environment, then these training programs may have limited utility, both for caregivers and for children (Rao, Beidel & Murray, 2008). In Study 2, in situ training was found to be effective for training caregivers how to use BST to support their children's context-specific social skills. These findings suggest that additional training, (e.g., in situ training), is provided to mediators to assist with generalization when it is possible to do so. In cases where additional mediator training is not possible, it may beneficial to spend time on training skills directly with clients and programming children's generalization of skills in other ways.

The general case approach used, has been shown to have greater generalization effects than standard approaches (e.g., Ducharme & Feldman, 1992). That is, caregivers were taught

using three self-identified examples but were evaluated on their ability to apply the skills to novel situations where they determined if the skill was appropriate to use. This may have allowed for caregivers to use the skills in more situations than if they were taught how to use BST only for specific skills. Relatedly, the current study had strong ecological validity as it was conducted in an applied setting and in conjunction with an agency. Research conducted in laboratory conditions may not always be replicated in applied settings or may have weaker effect sizes (e.g., Weisz, Donenberg, Han, & Weiss, 1995). Given the ecological validity of the study the implementation of the procedures are likely feasible and replicable by other researchers and clinicians without diminished effects.

Although the current research used 100% BST implementation accuracy as the mastery criteria, it is not clear what an acceptable level of intervention implementation is. That is, certain components of an intervention may be critical to outcomes, whereas other components can be missed with minimal impact (St. Peter Pipkin, Vollmer, & Sloman, 2010). The critical components were not analyzed in the current study for caregiver training or child support. Previous research has found mixed results of the necessary components of BST for different skills and mediators. For example, the full BST package was found to be necessary to teach caregivers to implement three-step prompting (Drifke et al., 2017), whereas feedback and modeling were found to be critical components for training teachers how to conduct a functional analysis (Ward-Horner, & Sturmey, 2012). It is not clear what steps of BST are critical for (1) training caregivers how to provide social skills support to children with ASD in natural environments or, (2) promoting children's social skill success in the natural environment. That is, although the study evaluated the use of individual BST, group BST and in situ training for caregivers, it is not clear what the necessary and sufficient components of the intervention (i.e.,

BST) are necessary for caregivers to successfully use BST and which components are necessary for child success. It is therefore possible, that although caregivers may not have reached mastery criteria (e.g., Ellen), their child may benefit as much as children of caregivers who did achieve mastery. During some sessions child success was 100%, although caregivers did not implement 100% of BST steps (e.g., in Study 2, Session 9, 11, 13-16 for Ellen). Given that children's performance was not impacted by caregiver BST accuracy in some instances, all steps of BST may not be necessary for all children to perform all skills. Future research should conduct component analyses to investigate the critical components of training for both caregivers and children.

Social skill deficits are a core diagnostic feature of ASD and improving children's social skills is a common goal that may benefit both children and their caregivers. For example, caregiver empowerment has been shown to be a mediator of stress in mothers of children with ASD (Weiss, MacMullin, & Lunsky, 2015). Empowering caregivers by training them to support their child's social skills may be beneficial, as caregiver stress levels may decrease as they found the training to be important, helpful and had higher confidence in their skills. This is especially true as caregivers of children with ASD may experience higher levels of stress compared to caregivers of children with other disabilities (Dunn, Burbine, Bowers, & Tantleff-Dunn, 2001). Although caregiver stress was not directly measured over-time, caregivers did indicate they were confident in their ability to implement BST, and found they had learned valuable skills whereas their previous knowledge was limited.

Limitations

Although these results are promising, it is important to note the scope and limitations. The research included eight participants with similar characteristics. Although formal

demographic data were not collected, all participants were enrolled in the same social skill group, from the same geographic location, with similar cultural backgrounds and were mothers of the children, except for one grandmother. Untested variables such as sex, cultural background, socioeconomic status or educational status may influence these results. In addition, the missing data in Study 2 weakens the internal validity of the study as there are fewer controls during each data collection session. Another limitation included the IOA data collection results, especially for child behavior. Overall, mean IOA data were high for both caregiver and child behavior. However, in both Studies 1 and 2, there was one instance of 0% agreement within a session (on one opportunity), which may be attributable to the extraneous variables in the live environment and the coders had competing demands. In both instances in which there was 0% agreement, there was only one opportunity for agreement and the secondary coder could have been distracted by other children in the environment as all data collection occurred live.

The secondary child outcome measure (i.e., child social skill success after caregiver prompt) had a few important limitations. First, only skills prompted using BST steps were examined. That is, this measure did not capture children's overall social skill opportunities or performance during a data collection session, which may not be representative of the child's overall social skill abilities. Second, the difficulty of the prompted social skills may have varied across children and sessions. For example, one caregiver may have targeted initiating a game whereas another caregiver may have targeted taking turns or being a gracious winner/loser. The types of skills were not matched for difficulty, and therefore child success may be related to the difficulty of the prompted skill and the child's previous experience, which was not standardized across data collection sessions or across participants. Third, all children in Study 1 and 2 were concurrently enrolled in a social skills group and were being prompted after receiving a lesson

on improving their social skills. It is conceivable that children's social skills would increase over the duration of the social skills group which coincided with the study. That is, children prompted during baseline may have received between one and four weeks of the social skills group, whereas the same children prompted during the treatment conditions may have received anywhere between three and eight weeks social skills training. In addition, half the probe data collection sessions were after the social skills group in Study 1, and all probe data collection sessions were after the social skills group in Study 2. Therefore, it is possible that the effect of having just received a social skills lesson may have increased the children's success rate for prompted social skills versus if they were prompted using BST at a different point in time. Follow-up measures taken two months after the social skills group reduced this concern, although it did take place in the same building. Lastly, it is unclear if the social skills that caregivers prompted in the natural environment would maintain over the long term. One consideration for lasting behaviour change is reinforcement (i.e., consequences after an action that increase the likelihood of a behaviour occurring under similar conditions; Cooper et al., 2007). In some cases of children with ASD, natural consequences may not be sufficient reinforcement to maintain appropriate social skills. That is, successfully producing a social skill and the consequences that follow (e.g., initiating play and being able to play with a peer) may not be reinforcing to the child to maintain the skill. Although the child may learn how to perform the skill, they may not do so on an ongoing basis and under different conditions. Caregivers may have provided praise to their children for successful use of their social skills as well. However, praise was not assessed for its reinforcing properties (i.e., in a reinforcer assessment) to know if providing praise would help children maintain their social skills. Given praise was not assessed as a reinforcer, it is possible that praise may not have reinforced the social skills the children

were being praised for and children may not maintain and/or perform the same skill under similar conditions that they demonstrate after being praised for performing the skill. Further, data were not collected on the number of opportunities caregivers had to prompt their child during data collection sessions. Therefore, caregivers may have had varying numbers of opportunities to prompt social skills depending on when they entered the free-play session. This possibility was mitigated by caregivers entering the room on a randomized schedule across all phases.

Hannah's results should be considered carefully due to the modifications to the procedures and her BST implementation not improving in any phase. Hannah's individual BST was modified to include textual prompts to accommodate her comprehension needs. When asked if she had any difficulties she indicated that she had no issues implementing BST. During in situ training Hannah indicated that she performed all steps of BST after being asked if she had forgotten to implement certain steps, if she was unsure how to do so in the natural environment or had difficulties finding opportunities. Although procedural integrity includes not adding additional components as well as following all planned components, it is important to individualize to caregiver needs from a clinical standpoint in the same way that individualizing for children may be important. Given the need to alter Hannah's training and her interpretations, her results may not be representative of the average caregiver.

Future Research and Conclusions

The results provide insight for training caregivers how to use BST to support their children's social skills. Future research should examine generalization and maintenance of caregiver BST implementation to other settings, over time, and with new skill domains. Core components of the intervention in the context of social skills and the impact of caregiver training

on overall child outcomes should also be examined. Different methods of increasing caregiver implementation of interventions should also be examined and compared for cost effectiveness. Training caregivers how to teach using BST may have other positive impacts such as increased feelings of self-confidence, decreased stress, positive effects on the relationship between caregiver and child, and enhanced quality of life. Future research should investigate if these potential relationships exist.

Although in situ training was found to be efficacious, other training methods should be examined as well. For example, implementation planning has been found to be effective at increasing caregivers' treatment integrity of behavioral interventions in children with ASD, which may be less resource intensive than in situ training (Fallon et al., 2016). Fallon and colleagues (2016) used implementation planning, which is a logistical planning and barrier reduction strategy, to increase mediator treatment integrity, which included: (a) an action plan detailing all steps of an intervention and related logistics (i.e., when, how often, for how long, and where, resources needed); and (b) a coping plan that identifies up to four potential implementation barriers and a corresponding strategy for implementing the intervention despite these barriers. Using implementation planning, the researchers increased caregiver and teacher treatment integrity for an intervention to reduce aggression and increase compliance in two children with ASD. It is possible that implementation planning may be an alternate strategy to in situ training requiring less resources.

Children with ASD often need ongoing social skill support as it is a core deficit and part of the diagnostic criteria for ASD. The results of these preliminary studies add to the body of research on ASD, BST and social skills training. The general case training approach may have contributed to caregivers' ability to support their child's context-specific social skills during free

play sessions, however most caregivers required in situ training to generalize BST implementation to the natural environment. Clinicians conducting social skills groups with caregivers might consider a general case BST approach combined with in situ training to promote generalization for both child and caregiver, which may otherwise be lacking. It is important to train caregivers to support this ongoing need of children with ASD in ways that can be generalized and maintained.

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Appendix A
Letter of Invitation

December 2016

We, Mahfuz Hassan, MA Candidate, and Dr. Kendra Thomson, Board Certified Behavior Analyst – Doctoral (BCBA-D) and Assistant Professor in the Centre for Applied Disability Studies at Brock University, invite you to participate in a research project called, "An Evaluation of Behavioral Skills Training for Teaching Caregivers How to Support Social Skill Development in Their Child with Autism Spectrum Disorder."

The purpose of this research project is to evaluate the efficacy of an evidence-based teaching method, behavioral skills training (BST), to teach caregivers how to support their children (ages 6-10) with autism spectrum disorder (ASD) to develop social skills.

To be eligible for this study, you must not have received prior training in social skills support, your child must have a formal diagnosis of ASD, be between the ages of 6-10, and be enrolled in a social skills group at Lake Ridge Community Support Services (LRCSS) in Whitby, Ontario.

Should you choose to participate you will spend approximately ten minutes after each of your child's social skills groups supporting them in developing their social skills and a self-report survey that should take less than five minutes to complete about social skills opportunities your child has had over the past week. In addition, you will receive a one-hour training that will occur at the same time as your child's social skills group. This training may occur from somewhere between Week 3 to Week 5 of the social skills group (we will notify you in advance). You will then receive additional training with your child present in the remaining weeks during the 10 minutes after their social skills group. A follow up session will also take place one month after the conclusion of your child's social skills program at LRCSS, where children will have a chance to play together with caregivers present. The training will be provided by the student principal investigator, Mahfuz Hassan and supervised by Dr. Thomson who has many years of clinical and research experience working with children with ASD and their caregivers. We will observe your attempts to support your child's social skills during the 10-minutes after their group sessions. We will also give you a brief questionnaire to fill out on your thoughts about the training, after the training and 1-month after receiving the training. The questionnaire will take approximately 5 minutes to complete.

This research has potential benefits for you to learn how to use BST to teach important social skills to your child. Your participation will also contribute to the lack of research on training for caregivers of children with ASD in general, and add to the body of research involving caregiver training in regard to BST as a training methodology for caregivers of youth with ASD specifically. The results of this study may influence future caregiver trainings at LRCSS.

Data (records of the training and practice sessions) will be kept in a secure location (i.e., a locked filing cabinet at Brock University and on a password-protected computer drive) for 10 years, after which point it will be destroyed confidentially. You and your child's **names will be removed from any data collected and instead, a numerical code will be assigned. Access to this data will be restricted to the primary investigator, student investigator, Lake Ridge clinical staff and trained research assistants (who will have signed lab confidentiality agreements before observing sessions or dealing with data). You or your child will never be identified in any way if/when the results of this study are published in a peer-reviewed journal or presented at professional conferences. If you or your child chooses to withdraw from the study, any data will be destroyed immediately in a confidential manner and will not have any impact on your** child's **participation in the social skills group, as the research and program are independent. Although all efforts will be made to maintain your anonymity, it may be limited as other caregivers and staff at LRCSS may be aware of participants of the study. Should you choose to participate in the study, you are requested to keep confidential any information about other participants that you may come across.**

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905) 688-5550 ext. 3035, reb@brocku.ca).

If you have any questions about the research, please feel free to contact either of us with the contact information provided below.

Thank you,

Email: mahfuz.hassan@brocku.ca; Ph: (416) 857-1205

Email: kthomson@brocku.ca; Ph: (905) 688-5550 x 6710

This study has been reviewed and received ethics clearance through Brock University's **Research Ethics Board # 15-286 - THOMSON**

Appendix B

Research Consent/Assent Form for Caregivers and Children

Project Title: **An Evaluation of Behavioral Skills Training for Teaching Caregivers How to Support Social Skill Development in Their Child with Autism Spectrum Disorder**

Student Principal Investigator: **Mahfuz Hassan, MA Candidate, Centre for Applied Disability Studies, Brock University**
Phone: (416) 857-1205; Email: mahfuz.hassan@brocku.ca

Faculty Investigator: **Dr. Kendra Thomson, Board Certified Behavior Analyst-Doctoral (BCBA-D), Assistant Professor, Centre for Applied Disability Studies, Brock University**
Phone: (905) 688-5550 x6710; Email: kthomson@brocku.ca

INVITATION

You and your child are invited to participate in a research project that is evaluating the effect of Behavioural Skills Training (BST) as a training method to help caregivers teach their child with autism spectrum disorder (ASD) how to support social skill development.

BST is an empirically supported teaching strategy that has been shown to be effective for teaching skills such as safety, behavioral teaching strategies, and communication skills. The current study will assess whether a one-hour BST session and training with your child present is helpful for you to support your child's social skill goals. This one-hour training will occur somewhere between Week 3 and Week 5 of your child's social skills group at Lake Ridge Community Support Services (LRCSS) with additional training occurring in the following weeks. This will depend on where you are assigned in the research design. The training will include the following four components: (1) instructions, telling you about how to best support your child in social skills; (2) modeling, showing you how to actually implement those instructions; (3) practice, role playing the skills you have learned; and (4) feedback, telling you how you did on your practice attempt. You will then receive additional training with your child present in the remaining weeks of your child's social skills group. In addition to the training, we will observe you with your child during their free-play sessions after the training part of their social skills group for approximately ten minutes each week. We will also ask you to complete a self-report survey that should take less than five minutes to complete about social skills opportunities your child has had over the past week. A follow up observation will also take place 1 month after the conclusion of your child's social skills program at LRCSS, where children will have a chance to play together with parents present. We will observe you support your child during the after their social skills group sessions before and after you receive the training. We will also give you a brief questionnaire to give us your feedback, both after the training and 1-month after you received the training. The form will take approximately 5 minutes to complete.

POTENTIAL BENEFITS AND RISKS

Possible benefits of participation may include:

- **Your participation may lead to feeling more confident in supporting your child's social skill development.**
- **Your participation may also contribute to the limited empirical research on caregiver training for children with ASD. Particularly as it relates to teaching social skills, and may influence future caregiver trainings at LRCSS.**

There also may be risks associated with participation:

- **You may feel obligated to participate in this research to receive the training; however, you will have an opportunity to receive the training in a group formatting at a later point should you choose not to participate in the research.**

CONFIDENTIALITY

Data (records of the training and practice sessions) will be kept in a secure location (i.e., a locked filing cabinet at Brock University and on a password-protected computer drive) for 10 years, after which point it will be destroyed confidentially. You and your child's **names will be removed from any data collected and instead, a numerical code will be assigned to any data collected. Access to this data will be restricted to the primary investigator, student investigator, LRCSS clinical staff and trained research assistants (who will have signed lab confidentiality agreements before observing sessions or dealing with data). You and your child will never be identified in any way if/when the results of this study are published in a peer-reviewed journal or presented at professional conferences. If you or your child chooses to withdraw from the study, any data will be destroyed immediately in a confidential manner and will not have any impact on your** child's **participation in the social skills group, as the research and program are independent. Although all efforts will be made to maintain anonymity, it may be limited as other caregivers and staff at LRCSS may be aware of participants of the study. Should you choose to participate in the study, you are requested to keep any information about other participants confidential.**

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. You or your child may decline to participate in any component of the study. Further, you may decide to withdraw your child from this study at any time and may do so without any reprisal from Brock University or LRCSS in any capacity.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Feedback about this study will be available from the student researcher Mahfuz Hassan, (mahfuz.hassan@brocku.ca) and Dr. Thomson (kthomson@brocku.ca) approximately 3-6 months after the study concludes.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact Mahfuz Hassan using the contact information

provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (REB#15-286). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

PARENT CONSENT

I agree to have my child, _____, participate in the study described above. I have made this decision based on the information I have read in this form and the Invitation Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

I have read this consent form and agree to participate in this study with my child.

I would like to receive a summary of the results of the study. ☐Yes ☐No

Parent Name: _____ Ph./Email:_____

Parent Signature : _____ Date : _____
(dd/mm/yy)

CHILD VERBAL ASSENT

We are wondering if you would like to help us with a science project. We want to teach you and your mom/dad how to help you with your goals at Lake Ridge. If you do this with your mom/dad, they would be able to help you with your goals with the Group Leaders teachers at Lake Ridge. It will involve your mom or dad watching you when you play and helping you with your friends if you need help with anything.

Your mom/dad have said *it's* ok if you take part in this, but we want to make sure that you want to. Do you want to take part in this? ☐Yes ☐No

---

For researcher only:
☐ I have reviewed this form in detail with the parent.
☐ I have provided a copy of this form to the parent.
Researcher initials: _____ Date: _____
(dd/mm/yy)

Appendix C

Data Sheet – Caregiver and Child Behavior

Participant ID: _____ **Caregiver Skill:** Supporting Social Skills

Phase of program: Baseline/ Training/Follow up **Session Number:** _____

Primary Observer Initials _____ Secondary Observer Initials_____

Complete all information for each trial and specify what skill is targeted for each trial.	**Opportunity #1** _____	**Opportunity #2** _____
1. Caregiver independently attempts to support their child in a social skill within 5 minutes	Y / N	Y / N
2. Caregiver provides instructions for child to engage in a social skill	Y / N	Y / N
3. Caregiver models the social skill for child	Y / N	Y / N
4. Caregiver allows child to attempt social skill (Rehearsal)	Y / N	Y / N
5. Caregiver provides praise for successful demonstration of the skill OR Caregiver provides feedback to child on their unsuccessful attempt at the skill.	Y / N	Y / N
Child: Child successfully performs the social skill that the caregiver prompted.	Y / N	Y / N
Calculate % correct: (number of y/number of y + n) x 100. Do not include "Child" in calculations.		

Each "trial" is considered any verbal exchange (does not have to be an instruction) that the caregiver has with the child that refers to a social skill (e.g., about initiating eye contact, initiating conversation vs. waiting for other to speak first, conversation skills, etc.). Each specific skill a caregiver mentions is considered a separate trial. For example, if a caregiver says, "Look at your friend in the eye when you talk to him and let him have a turn at the game" is two trials (i.e., eye contact, turn taking).

Operational Definitions:

Attempts: Caregiver attempts to support a social skill without a prompt from a trainer (i.e., if the caregiver provides instructions or models without a prompt in the in-situ phase).
Instructions: Caregiver verbally tells the child how to engage in a social skill that includes someone else.
Exclusion: A request to do something that does not include another person (i.e. is not social).
Modeling: After an instruction, caregiver demonstrates how to perform a social skill, after using a phrase indicating to imitate the skill (e.g. "Watch what I do. I am going to show you what _____looks like."). *Exclusion:* If the caregiver does not indicate to the child to imitate (verbally) or is not social in nature.
Rehearsal: Caregiver asks the child to practice the skill, either with another child or with the caregiver after demonstrating to the child what to do. *Exclusion:* If the caregiver has not provided instructions or modeling.
Feedback: If the child is successful and there are no errors at attempting the social skill, caregiver provides praise either during or after the child attempts the social skill. If the child is unsuccessful or has errors at attempting the social skill, caregiver provides input that may help make corrections. *Exclusion:* If comments are not in reference to the social skill

Appendix D

Social Validity Questionnaire

Please complete this anonymous questionnaire to assist the researcher in evaluating the social importance of the research that you participated in. Place an "x" in the column that represents **how much you agree or disagree with each statement. If you place an x under the 5, that indicates that you completely agree, 1 indicates that you completely disagree, and 3 indicates that you are neutral, or do not agree or disagree.**

	1 Disagree	2 Somewhat Disagree	3 Neutral	4 Somewhat Agree	5 Agree
Goals					
1. I think that the goal of the study, to evaluate strategies for caregivers how to provide social support with children with ASD is important.					
Procedures					
2. I found my prior knowledge of how to support my child in social skills sufficient.					
3. I found that the behavioral skills training (BST) helped me gain knowledge in supporting my child in social skills.					
4. I found the trainer knowledgeable and helpful to my learning of supporting my child in social skills.					
Effects					
5. I feel confident that I can support my child in obtaining their social skills goals.					
6. I think that what I have learned will help me as a caregiver to support my child in social skills.					
7. I have learned important skills by participating in this study.					
8. I would recommend BST to other caregivers who have children with ASD.					
9. I will/do use BST to help my child develop social skills regularly.					

Additional Comments

_____
_____
_____
_____
_____

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This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University #15-286. If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905) 688-5550 ext. 3035, reb@brocku.ca).

Appendix E

Data Sheet – Trainer Checklist

Introduction

1. The trainer introduces themselves and goes over the participant's rights in research, and key study details (e.g. right to breaks/withdrawal, not to share training, etc.) ☐
2. The trainer provides the caregiver with the reference sheet ☐
3. The trainer provides the caregiver an overview of what BST is, how it is currently used with their child in the social skills groups and how it may be helpful for the caregiver ☐
4. The trainer discusses examples of where BST can be used with the caregiver and notes it down on the reference sheet ☐

Instructions and Modeling

5. The trainer verbally reviews instructions:
    a. ensuring the child is attending ☐
    b. using appropriate language ☐
    c. ensuring understanding ☐
6. The trainer verbally goes over modelling:
    a. why to model ☐
    b. how to model ☐
7. The trainer models/acts out how to use instructions and how to model social skills:
    a. models appropriate examples ☐
    b. models inappropriate examples ☐
    c. discusses the differences with the caregiver ☐
8. The trainer rehearses with the caregiver the examples chosen in Step 4 for instructions and modeling specifically ☐
9. The trainer provides feedback (during or after) and reinforces attempts ☐

Rehearsal and Feedback

10. The trainer verbally goes over rehearsal:
    a. importance of rehearsal ☐
    b. how to provide opportunities for their child to practice ☐
    c. how to provide effective feedback ☐
    d. providing praise for appropriate attempts ☐
11. The trainer models an example of using BST in its entirety ☐
12. The trainer rehearses (examples from reference sheet) with the caregiver the examples chosen in Step 4 for BST in its entirety until the caregiver is able to perform at 100% ☐
13. The trainer provides feedback (during or after) and reinforces attempts ☐

Social Validity Questionnaire

14. The trainer will provide the caregiver the Social Validity Questionnaire to the caregiver and ask the caregiver to do question #10 with their child ☐

Appendix F
Reference for Caregivers

What is Behavioral Skills Training (BST)?

Behavioral Skills Training (BST) is a four-step training method that has been shown to be effective for teaching a variety of new skills, such as swimming, fire safety skills, behavioural teaching strategies, and many others. The four components of BST include instruction, modeling, rehearsal, and feedback. BST is an active teaching and learning strategy in that it provides information in different ways.

How can BST help you and your child?

We would like to use BST to help you to help your child develop social skills. We will help you become comfortable with the four components of BST (instruction, modeling, rehearsal and feedback):

Instruction**: This involves explaining to your child what to do or how to do something. When giving instructions to your child, it is important to remember: to make sure your child is listening before you give the instruction, to use concrete language that is easy to understand, and, to ensure that they understood what you said by asking them to explain in their own words. Sometimes it may also be helpful to provide examples of both what to do, and what not to do to show the difference. For example, after e**nsuring your child is listening and attending to you, saying "When you walk into a **room and see your friend, look at their eyes and say hello instead of looking at the floor** when you say hello."

Modeling**: Sometimes we stop teaching after providing instructions. It is important however, to perform additional steps to improve outcomes. Instructions alone only provide the information in one way. Showing your child how to do something provides additional cues. Using the example from above, if you want your child to look at their friend in the eyes when they say hello, you can demonstrate the skill (look at** someone else in the eye and saying hello) and say to your child, "Watch! I'm going to show you what it looks like" or simply, "Do this" or any other phrase a**t the end of your instruction and demonstration of the skill.**

Rehearsal**: Rehearsal is allowing your child to actually try the skill after receiving instructions and seeing someone else demonstrate it. This is a good opportunity for you to see whether your child can actually perform what you are attempting to teach. You then either provide lots of praise, or feedback as described below. Rehearsal can be natural or roleplayed depending on the scenario.**

Feedback**: Feedback is letting your child know how they**'ve done and should **occur during rehearsal or immediately after, depending on the situation. It is important to point out what your child is doing well and to provide positive feedback (e.g., "Great job looking at your friend in the eyes when you said hello."). It is also important to point out where your child can improve by providing clear explanations (e.g., "I really liked that you said 'hi' to your friend, but next time, make sure you look him in the eyes. Let's**

practice that one more time."). If you gave additional feedback to your child when they attempted the skill, have your child attempt the skills one more time and provide assistance if needed and again, provide praise for successful attempts.

You can use BST to practice social skills with your child at home, on play dates, and when you are in the community. Remember to ensure that your child is paying attention, provide instructions, model or show them how to do it, practice with them, praise them for what they did well and provide feedback on what needs further practice. You can refer to this reference sheet at any time.

What are the social skills that your child is currently developing?

Example 1:

_____
_____

Notes:

_____
_____
_____
_____

Example 2:

_____
_____

Notes:

_____
_____
_____
_____

Example 3

_____
_____

Notes:

_____
_____
_____
_____

Appendix G
Social Skills Opportunities

Consider the past week when answering the following questions. Place an "x" in the column that represents how frequently each of the statements below happened. If you place an x under the 5, that indicates that this always happened, 1 indicates that this never happened, and 3 indicates that this happened sometimes.

	1 Never	2 Rarely	3 Sometimes	4 Most of the time	5 Always
1. When my child was in social situations, they required help (e.g., my child went over to a peer but did not initiate conversation/play with the other child independently).					
2. I was able to identify how to help my child in social situations in which they required help.					
3. I told my child how to perform a social skill (either before or in the moment).					
4. I showed my child how to perform a social skill (either before or in the moment)					
5. I practiced with my child how to use a social skill (before or in the moment)					
6. I told my child they did well when they used the social skill appropriately					
7. I told my child how to improve on their social skills if they used it inappropriately or didn't use it at all after I had prompted them					
8. My child engaged in appropriate social skills when I prompted them.					
9. My child engaged in appropriate social skills independently.					
10. I believe my child needs help with their social skills development.					
11. I feel confident in how to best help my child with their social skill development.					

Additional Comments: _____
_____